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WAR MACHINE

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Blitzkrieg Bomber

A Shot in the Dark:
Night Harassment



A fully illustrated guide to Axis Ground Attack Aircraft

WAR MACHINE

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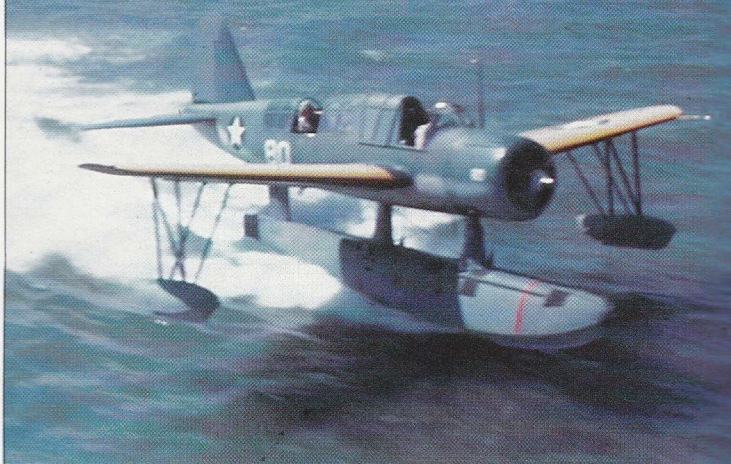
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Axis Ground Attack Aircraft

Ground attack aircraft played a vital role in the victorious German campaigns of 1939-41. The German army's Blitzkrieg doctrine involved close integration of tactical air power and mechanized army units, and this combination of Panzer mobility and airborne artillery firepower seemed to be unstoppable.

One of the most significant aspects of the history of land warfare in Europe during World War II was the inexorable change in the relative air power of the Axis and Allies over the battlefields. When the war started the German army was the principal weapon of aggression, to which all else played a supporting role; its tactic was Blitzkrieg, the smashing of all opposition by assault troops with fast-moving armour continuously supported by tactical aircraft. So long as the Luftwaffe possessed air superiority over the ground battle, the German army held the initiative. This had been the pervading doctrine that dictated the swift expansion of Germany's armed forces which followed the Nazis taking power in 1933.

By contrast the Allies had almost totally ignored air support of their armies, other than to provide very limited tactical reconnaissance. This proved a major cause of defeat after defeat during the first two years of the war as Poland, Denmark, Norway, the Netherlands, Belgium, France, Yugoslavia, Greece and Crete fell to the smashing blows of Blitzkrieg.

Inevitably, the mounting losses suffered by the Luftwaffe on the Eastern Front and in the Mediterranean (as Allied strength increased everywhere) deprived the Luftwaffe of air superiority over the land battle. The traditional weapon of Blitzkrieg, the notorious Stuka (the Junkers Ju 87), could no longer attack at will, being faced by formidable fighter opposition almost everywhere. Yet in the absence of a more advanced Stuka-

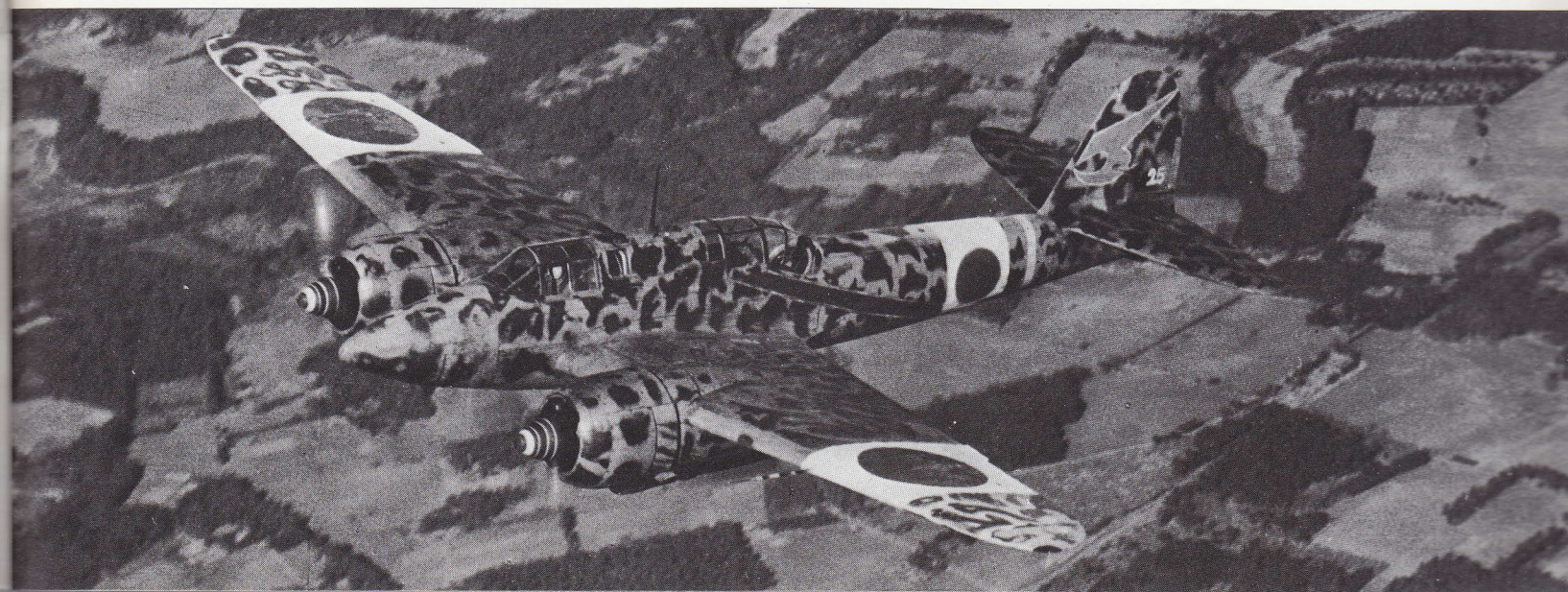


The Junkers Ju 87 Stuka became a fearsome sight for Allied ground troops in the first two years of the war. The close co-ordination of Luftwaffe ground attack aircraft with the Wehrmacht mechanized divisions was in sharp contrast with the inter-service rivalry characteristic of their enemies.

replacement, the Germans were forced to persevere with this weapon, and thereby suffered catastrophic losses. Such efforts as they were able to extemporize tended to be set-piece expedients, planned and executed by the Luftwaffe, rather than continuous support that could be called up by the ground forces in a moment of emergency and immediately appreciated by the hard-pressed soldier. Once the German army no longer saw friendly aircraft continuously overhead, Blitzkrieg was impossible.

No other Axis air force had been as closely integrated with the land forces as the Luftwaffe. The Allies were quick to appreciate the paramount importance of assuming air superiority over the ground battle, so much so that after the pendulum of fortune swung back after Stalingrad and El Alamein the British, Soviet and American armies were afforded powerful and continuous air support. In truth the Luftwaffe no longer had it in its power to dispute Allied superiority in the skies above the German army.

A two-seat fighter similar in concept to the Messerschmitt Bf 110, the Kawasaki Ki-45 followed a similar career pattern to the German aircraft and was modified for both night-fighting and ground attack. In the latter role the Ki-45 KAI carried a variety of major-calibre cannon, including a 75-mm (2.95-in) weapon.



JAPAN



Mitsubishi Ki-30

In May 1936 the Imperial Japanese Army issued its specification for a light bomber required to supersede the Mitsubishi Ki-2 and Kawasaki Ki-3 then in service. The **Mitsubishi Ki-30** prototype that resulted was of cantilever mid-wing monoplane configuration with fixed tailwheel landing gear, the main units faired and spatted, and powered by a 615-kW (825-hp) Mitsubishi Ha-6 radial engine. Flown for the first time on 28 February 1937 this aircraft performed well, but it was decided to fly a second prototype with the more powerful Nakajima Ha-5 KAI radial engine. This aircraft showed some slight improvement in performance but, in any case, exceeded the army's original specification, so there was no hesitation in ordering 16 service trials aircraft. These were delivered in January 1938 and, two months later, the Ki-39 was ordered into production.

First used operationally in China during 1938, the Ki-30s proved to be most effective, for in that theatre they had the benefit of fighter escort. The situation was very much the same at the beginning of the Pacific war, but as soon as the Allies were in a position to confront unescorted Ki-30s with fighter aircraft they immediately began to suffer heavy losses and were soon relegated to second-line use. The Allied codename **'Ann'** was allocated to the Ki-30, but few were seen operationally after the opening phases of the war. A total of 704 had been built when pro-

duction ended in 1941, 68 manufactured by the First Army Air Arsenal at Tachikawa, and many of these ended their days in a *kamikaze* role during the closing stages of the war.

Specification

Type: two-seat light bomber

Powerplant: one 708-kW (950-hp)

Nakajima Ha-5 KAI radial piston engine

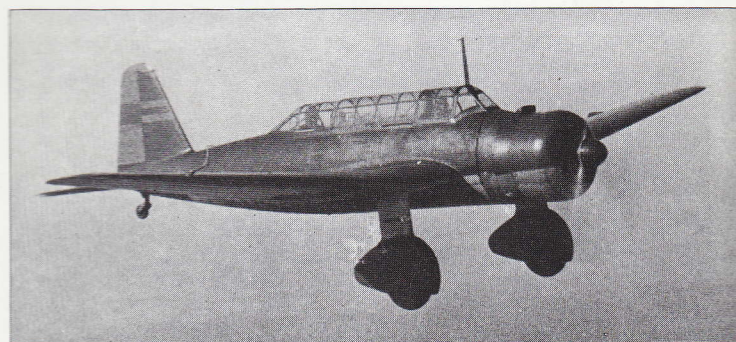
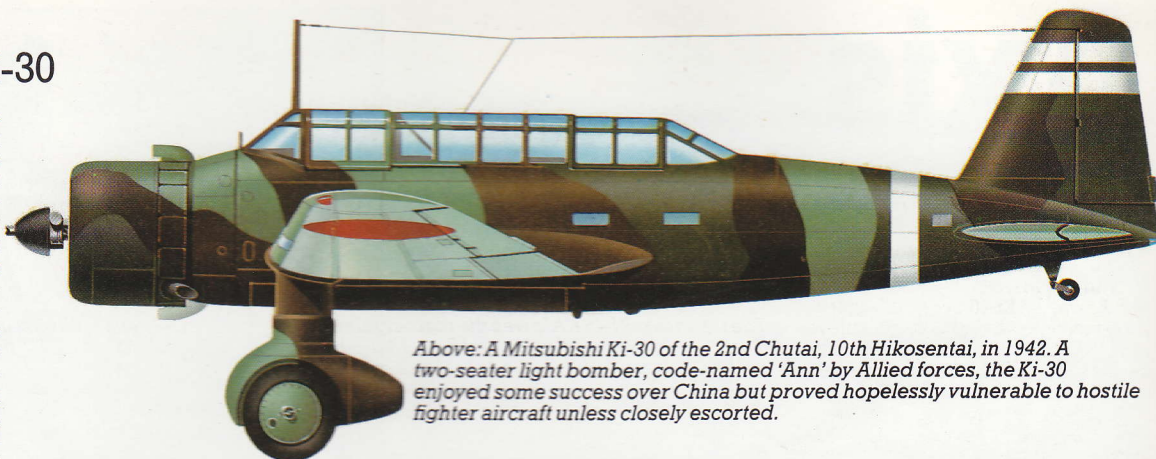
Performance: maximum speed 423 km/h (263 mph) at 4000 m (13,125 ft); cruising speed 380 km/h (236 mph); service ceiling 8570 m (28,115 ft); range 1700 km (1,056 miles)

Weights: empty 2230 kg (4,916 lb);

maximum take-off 3220 kg (7,099 lb)

Dimensions: span 14.55 m (47 ft 8.8 in); length 10.35 m (33 ft 11.5 in); height 3.65 m (11 ft 11.7 in); wing area 30.58 m² (329.17 sq ft)

Above: A Mitsubishi Ki-30 of the 2nd Chutai, 10th Hikosentai, in 1942. A two-seater light bomber, code-named 'Ann' by Allied forces, the Ki-30 enjoyed some success over China but proved hopelessly vulnerable to hostile fighter aircraft unless closely escorted.



Armament: one wing-mounted 7.7-mm (0.303-in) machine-gun and one gun of the same calibre on trainable mount in rear cockpit, plus a maximum bombload of 400 kg (882 lb)

Above: By the time production ended in 1941 over 700 Ki-30s had been produced and the type had largely been relegated to second-line use.

JAPAN



Mitsubishi Ki-51

To meet an Imperial Japanese Army specification of December 1937 for a ground-attack aircraft, which it was suggested could be a development of the Ki-30 light bomber, Mitsubishi produced two prototypes under the designation **Mitsubishi Ki-51**. Of similar external appearance to the Ki-30, the new design was generally of smaller dimensions, had a revised and simplified cockpit that put the two-man crew more closely together and, because the bomb bay was not required, the monoplane wing was moved from a mid- to low-wing configuration. Powerplant chosen was the Mitsubishi Ha-26-II radial engine.

Tested during the summer of 1939, the two prototypes were followed by 11 service trials aircraft, these being completed before the end of the year. They differed from the prototypes by incorporating a number of modifications, but most important were the introduction of fixed leading-edge slots to improve slow-speed handling and armour plate beneath the engine and crew positions. In addition to the standard production aircraft, there were attempts to develop dedicated reconnaissance versions, initially by the conversion of one Ki-51 service trials aircraft which had the rear cockpit redesigned to accommodate reconnaissance cameras. Test and evaluation of this aircraft, redesignated Ki-51a, brought a realization that the standard Ki-51 could be modified to have provisions for the installation of reconnaissance cameras, and this change was made on the production line. Subsequently, three Ki-71 tactical reconnaissance prototypes were developed from the Ki-51, introducing the 1119-

kW (1,500-hp) Mitsubishi Ha-112-II engine, retractable landing gear, two wing-mounted 20-mm cannon and other refinements, but no production examples were built.

Allocated the Allied codename **'Sonia'**, the Ki-51 was used initially in operations against China, and was deployed against the Allies until the end of the Pacific war. In more intensely contested areas the fairly slow Ki-51s were easy prey for Allied fighters, but in secondary theatres, where an ability to operate from rough and short fields was valuable, these aircraft gave essential close support in countless operations. In the closing stages of the

war they were used in *kamikaze* attacks.

Specification

Mitsubishi Ki-51

Type: two-seat ground-attack/reconnaissance aircraft

Powerplant: one 701-kW (940-hp)

Mitsubishi Ha-26-II radial piston engine

Performance: maximum speed 425 km/h (264 mph) at 3000 m (9,845 ft); service ceiling 8270 m (27,130 ft); range 1060 km (659 miles)

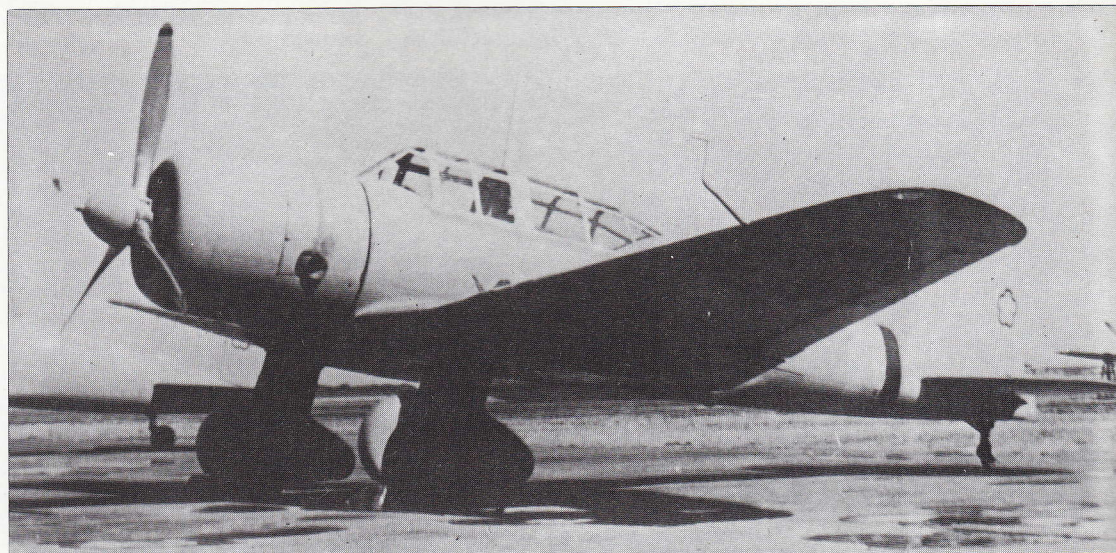
Weights: empty 1873 kg (4,129 lb); maximum take-off 2920 kg (6,437 lb)

Dimensions: span 12.10 m (39 ft 8.4 in);

length 9.20 m (30 ft 2.2 in); height 2.73 m (8 ft 11.5 in); wing area 24.02 m² (258.56 sq ft)

Armament: two wing-mounted 7.7-mm (0.303-in) machine-guns (early production) or two wing-mounted 12.7-mm (0.5-in) guns (late production), and one 7.7-mm (0.303-in) gun on trainable mount in rear cockpit, plus a bombload of 200 kg (441 lb) increasing to 250 kg (551 lb) in *kamikaze* role

Slow and vulnerable, the Mitsubishi Ki-51 nevertheless served throughout the war, mainly in secondary theatres, where its rough landing capability was a valuable asset.

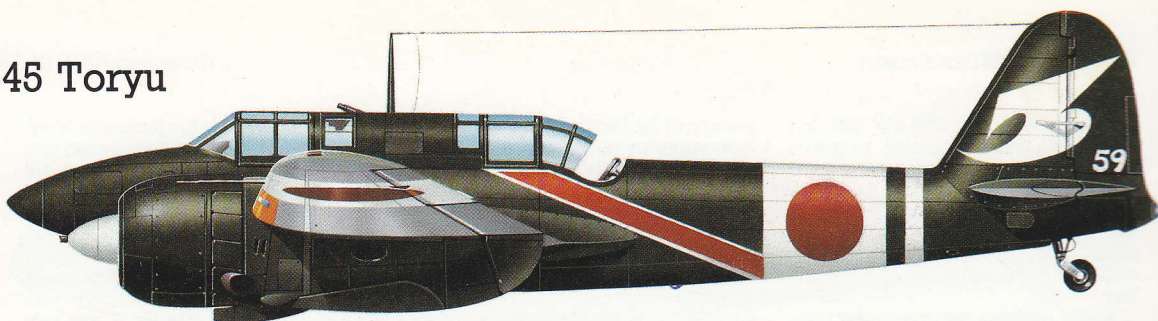




JAPAN

Kawasaki Ki-45 Toryu

In early 1937 Kawasaki was instructed by the Imperial Japanese army to initiate the design and development of a twin-engine fighter that would be suitable for long-range operations over the Pacific. The concept derived from army interest in developments taking place in other countries, and particularly in the Messerschmitt Bf 110. The first **Kawasaki Ki-45 Toryu** (dragon killer) prototype flew in 1939, a cantilever mid-wing monoplane with retractable tailwheel landing gear. A slender fuselage provided enclosed accommodation for two in tandem. Problems followed with the engine installation, and it was not until September 1941 that the **Ki-45 KAIa** entered production. Armament of this initial series version comprised one forward-firing 20-mm cannon, two 12.7-mm (0.5-in) machine-guns in the nose, and a 7.92-mm (0.31-in) machine-gun on a flexible mount in the rear cockpit; there was also provision to carry two drop tanks or two 250-kg (551-lb) bombs on underwing racks. The type entered service in August 1942 but was first used in combat during October 1942, soon being allocated the Allied code-name 'Nick'. The Ki-45 KAIa was joined by a new version developed especially for the ground-attack/anti-shipping role, the **Ki-45 KAIb**. Stan-



The Kawasaki Ki-45 KAIc was the night-fighter variant of this highly successful twin-engined fighter-bomber. Carrying one forward-firing and two obliquely-mounted upward-firing cannon, this is a machine belonging to the 1st Chutai, 53rd Sentai, based at Matsudo in early 1945.

dard armament comprised one 20-mm cannon in the nose, a forward-firing 37-mm cannon in the fuselage, and one rear-firing 7.92-mm (0.31-in) machine-gun, plus the underwing provision for drop tanks or bombs; a number of alternative weapon installations were tried experimentally, including the use of a 75-mm (2.95-in) cannon for attacks on shipping.

The Ki-45 KAIa was, for its day, heavily armed and proved effective against the USAF's Consolidated B-24 Liberators and, when these bombers were used more extensively for night operations, the Ki-45 was adapted to attack them. Thus the night-fighting capability of the type was discovered, leading to development of the Ki-45 KAIc night-fighter, which proved to be

one of the most successful Japanese aircraft in this category. Ki-45 Toryus remained in service until the end of the Pacific war, production totalling 1,701 including prototypes, being used for the defence of Tokyo, and in the Manchuria, Burma and Sumatra areas of operations.

Specification

Kawasaki Ki-45 KAIc

Type: two-seat night-fighter

Powerplant: two 805-kW (1,080-hp)

Mitsubishi Ha-102 radial piston engines

Performance: maximum speed 545 km/h (339 mph) at 7000 m (22,965 ft); climb to 5000 m (16,405 ft) in 6 minutes 7 seconds; service ceiling 10000 m (32,810 ft); range 2000 km

(1,243 miles)

Weights: empty 4000 kg (8,818 lb);

maximum take-off 5500 kg (12,125 lb)

Dimensions: span 15.05 m (49 ft 4.5 in);

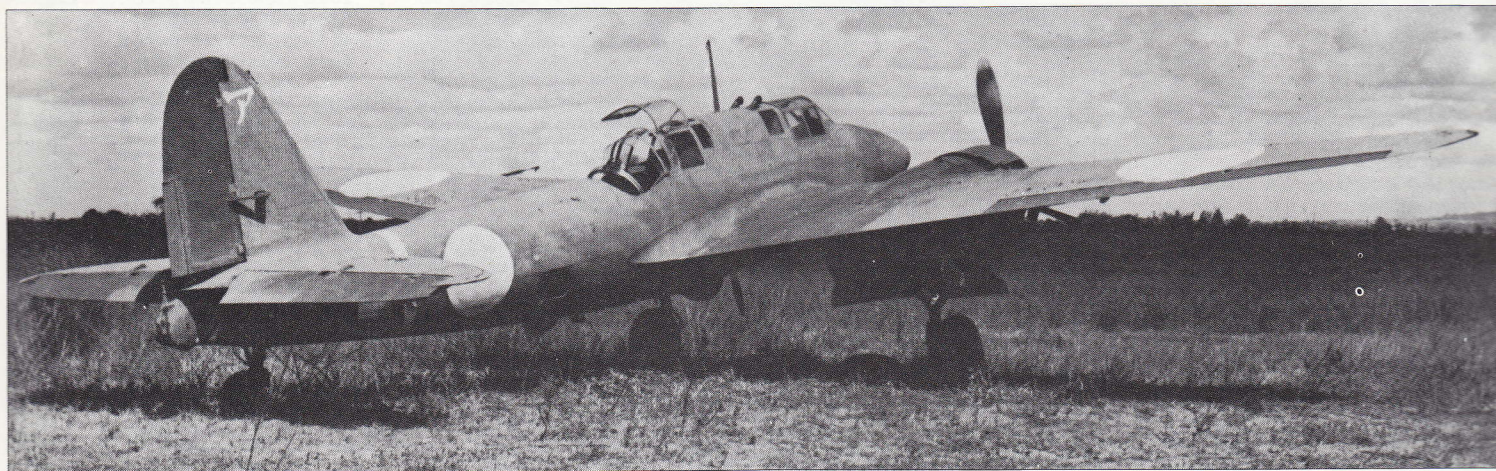
length 11.00 m (36 ft 1.1 in); height

3.70 m (12 ft 1.7 in); wing area 32.00 m²

(344.46 sq ft)

Armament: cannon and machine-guns as listed in text; all versions had provision for two drop tanks or two 250-kg (551-lb) bombs on underwing racks

Heavily armed by Japanese standards, the Kawasaki Ki-45 was developed as a long-range fighter. It doubled as a ground attack aircraft, one model being fitted with an experimental 75-mm (2.95-in) mount for the anti-shipping role.

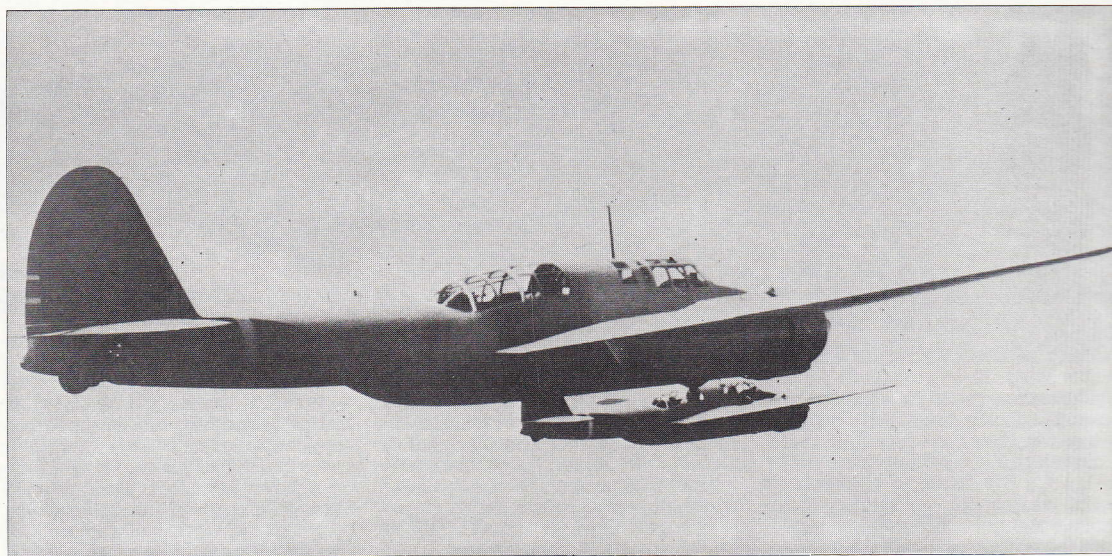


JAPAN

Kawasaki Ki-48

Imperial Japanese Army aircraft confronted by the Soviet-built Tupolev SB-2 bomber, providing support for the Chinese during 1937, were rudely surprised by its capability, its maximum speed being such that Japanese army fighter aircraft were virtually unable to intercept it. Almost at once the army instructed Kawasaki to begin the design of a twin-engine light bomber of even better capability, specifying a maximum speed of about 485 km/h (301 mph). Work on what was to become known as the **Kawasaki Ki-48** began in January 1938, the result being a cantilever mid-wing monoplane with conventional tail unit, retractable tailwheel landing gear and, in the type's

In 1937 the Japanese encountered the Tupolev SB-2 in Chinese hands, and were very impressed as the Soviet aircraft could outpace Japanese fighters. The Ki-48 was Japan's reply: a light bomber of similar appearance.



Kawasaki Ki-48 (continued)

prototype form, two 708-kW (950-hp) Nakajima Ha-25 radial engines mounted in nacelles at the wing leading edges. The fuselage provided accommodation for a crew of four (the bombardier, navigator and radio-operator each doubling as gunners) and incorporated an internal bomb bay.

Ki-48s entered service in the summer of 1940, becoming operational in China during the autumn of that year. In China their speed gave the Ki-48s almost complete immunity from enemy defences, but their deployment against Allied aircraft at the be-

ginning of the Pacific war revealed that their superior performance was illusory. Codenamed 'Lily' by the Allies, this initial production version had a number of deficiencies for the different kind of operations then required, and it was fortunate for the Japanese army that an improved version was already under development. This had the company designation **Ki-48-II** and differed from the earlier model by introducing a slightly lengthened fuselage, protected fuel tanks, armour protection for the crew, increased bombload and more powerful Nakajima Ha-115 engines.

Unfortunately for the Japanese army, when the Ki-48-II was introduced into operational service its speed was still too low and its defensive armament inadequate. Attempts to increase armament merely upped the overall weight and speed suffered proportionately: it was clear by the summer of 1944 that the day of the Ki-48 had passed, and in October it was declared obsolescent.

Specification
Kawasaki Ki-48-IIb
Type: four-seat light/dive-bomber
Powerplant: two 858-kW (1,150-hp)

Nakajima Ha-115 radial piston engines
Performance: maximum speed 505 km/h (314 mph) at 5600 m (18,375 ft); service ceiling 10100 m (33,135 ft); maximum range 2400 km (1,491 miles)
Weights: empty 4550 kg (10,031 lb); maximum take-off 6750 kg (14,881 lb)
Dimensions: span 17.45 m (57 ft 3 in); length 12.75 m (41 ft 10 in); height 3.80 m (12 ft 5.6 in); wing area 40.00 m² (430.57 sq ft)
Armament: three 7.7-mm (0.303-in) machine-guns on trainable mounts in nose, dorsal and ventral positions, plus up to 800 kg (1,764 lb) of bombs

JAPAN



Kawasaki Ki-102

Derived from the Ki-96 twin-engine single-seat fighter, development of which was abandoned after three prototypes had been completed, the **Kawasaki Ki-102b** was intended as a two-seat attack fighter for primary deployment in the close-support role. Some assemblies of the Ki-96 prototypes were incorporated into the three Ki-102 prototypes, the first of which was completed in March 1944. A cantilever mid-wing monoplane with a conventional tail unit, retractable tail-wheel landing gear and two Mitsubishi Ha-112-II radial engines, the Ki-102 accommodated its two-man crew in separate enclosed cockpits in tandem. Completion of the prototypes was followed by the construction of 20 pre-production aircraft and in October 1944 the type was ordered into production. With the Imperial Japanese Army still anxious to procure a twin-engine high-altitude fighter, Kawasaki modified six of the preproduction Ki-102s to serve as prototypes of such an interceptor. This differed from the attack fighter by having improved two-seat accommodation, a revised tail unit and Mitsubishi Ha-112-II engines with turbochargers. Successful testing of this version in mid-1944 resulted in a high-priority production order, but problems with the turbocharged engine resulted in only about 15 being

delivered to the army before the war ended. The design had also been revised to produce a night-fighter version under the designation Ki-102c, but there was only time to complete two examples. These had increased wing span, a lengthened fuselage, redesigned tail surfaces, primitive AI radar, and armament comprising two 30-mm Ho-105 cannon in the underfuselage and two 20-mm Ho-5 cannon mounted obliquely in the fuselage to fire forward and upward. Ki-102b aircraft, which were allocated the Allied code-name 'Randy', saw comparatively little service, some being used in action over Okinawa, but the majority were

held in reserve in Japan.

Specification
Kawasaki Ki-102b
Type: twin-engine ground-attack aircraft
Powerplant: two 1119-kW (1,500-hp) Mitsubishi Ha-112-II radial piston engines
Performance: maximum speed 580 km/h (360 mph) at 6000 m (19,685 ft); service ceiling 11000 m (36,090 ft); range 2000 km (1,243 miles)
Weights: empty 4950 kg (10,913 lb); maximum take-off 7300 kg (16,094 lb)
Dimensions: span 15.57 m (51 ft 1 in); length 11.45 m (37 ft 6.8 in); height

3.70 m (12 ft 1.7 in); wing area 34.00 m² (365.98 sq ft)
Armament: one 57-mm Ho-401 cannon in the nose, two 20-mm Ho-5 cannon in the underfuselage, and one 12.7-mm (0.5-in) machine-gun on a flexible mounting in the rear cockpit, plus two 200-litre (44-imp gal) drop tanks or two 250-kg (551-lb) bombs carried on underwing racks

The Ki-102b in its ground attack form entered service around November 1944, a few seeing action at Okinawa but the majority being retained to defend the homeland from the expected invasion.



ITALY



Caproni Bergamaschi Ca 306/Ca 309/310/314

At the 1935 Milan Exhibition there appeared the prototype of the **Caproni Bergamaschi Ca 306 Borea** (north wind), a six-passenger low-wing transport. Although built only in small numbers, the Borea was important as the progenitor of a range of light twin-engine aircraft manufactured for a wide variety of roles. The first of these was the aptly-named **Ca-309 Ghibli** (desert wind), 78 of which were built for use in Libya. The military versions were used as light transports or reconnaissance bombers with a lengthened glazed nose, bomb racks, cameras, and with armament comprising three 7.7-mm (0.303-in) machine-guns. Another model featured a fixed forward firing 20-mm cannon. Seven squadrons equipped with Ghiblis were operational when Italy entered the war in 1940.

Developed in parallel with the Ghibli, the **Ca 310 Libeccio** (south west wind) was structurally similar to the earlier machine, but was provided with retractable landing gear and po-



A Caproni Ca 310 Libeccio (south west wind), is seen in Norwegian service based at Sola airfield near Stavanger. Other countries to acquire the Ca 310 included Peru and Yugoslavia.

wered by two 350-kW (470-hp) Piaggio P.VII C.35 radial engines. Export deliveries went to Norway, Peru and Yugoslavia, and this last nation also acquired 12 more under the designation **Ca 310bis**; this variant differed primarily by having an unstepped extensively-glazed nose.

The prototype of the Ca 310bis served as a development aircraft for

the following **Ca 311**. As built they were similar to the Ca 310bis, but most were later modified by the introduction of a stepped windscreen, then being redesignated **Ca 311M**. Defensive armament of this version comprised a Caproni Lanciani turret with a single 7.7-mm (0.303-in) machine-gun, complemented by one machine-gun in the port wing root and another firing aft

through a ventral hatch. A modified Ca 310 with two Isotta-Fraschini Asso 120 IRCC 40 engines served as the **Ca 313** prototype, first flown on 22 December 1939, but France had already confirmed an order for 200 of these aircraft on 1 October, followed closely by British and Swedish orders for 300 and 64 respectively. However, Italy's entry into the war prevented delivery of any

Caproni Bergamaschi Ca 306/Ca 309/310/314 (continued)

of the British machines and France received only five **Ca 313F** models, the remainder being diverted to the Regia Aeronautica.

Most extensively built version was the **Ca 314**. Variants included the **Ca 314A** or **Ca 314-SC** (Scorta), a convoy escort/maritime patrol aircraft, the **Ca 314B** or **Ca 314-RA** (Ricognizione Aeromilitare) torpedo-bomber and the ground-attack **Ca 314C**.

Specification

Caproni Ca 314A

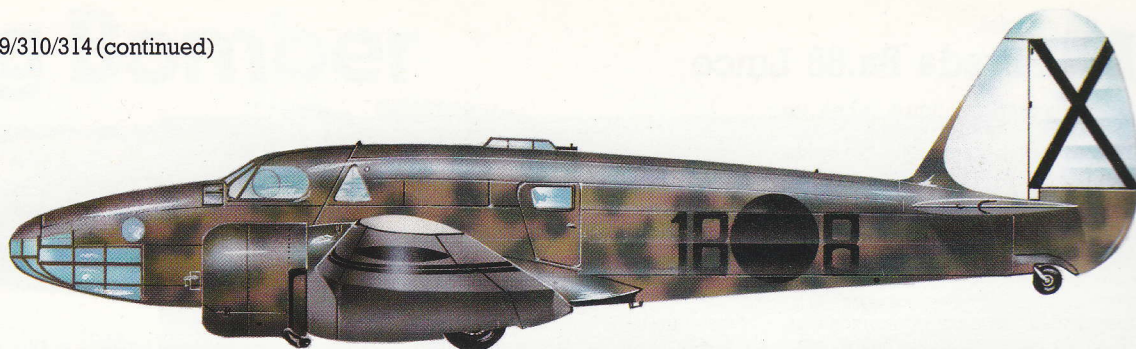
Type: convoy escort and maritime patrol aircraft

Powerplant: two 544-kW (730-hp) Isotta-Fraschini Delta RC.35 12-cylinder inverted-Vee piston engines

Performance: maximum speed 395 km/h (245 mph) at 4000 m (13,125 ft); cruising speed 320 km/h (199 mph) at 4200 m (13,780 ft); service ceiling 6400 m (21,000 ft); maximum range 1690 km (1,050 miles)

Weights: empty 4560 kg (10,053 lb); maximum take-off 6620 kg (14,595 lb)

Dimensions: span 16.65 m (54 ft 7.5 in);

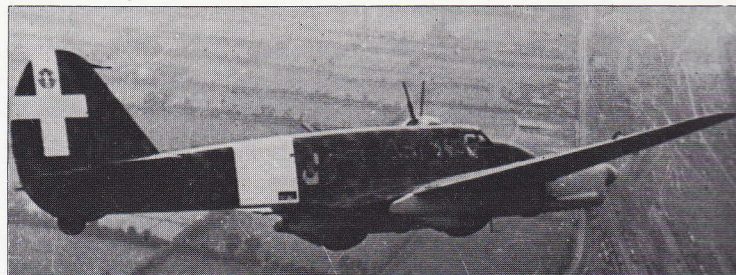


This Caproni Ca 310M of the 8ª Escuadrilla, Grupo 18, Agrupacion Espanola (the Nationalist air force), operated in Spain during late 1938.

length 11.80 m (38 ft 8.6 in); height 3.70 m (12 ft 1.7 in); wing area 39.20 m² (421.96 sq ft)

Armament: two 12.7-mm (0.5-in) machine-guns in the wing roots and one 7.7-mm (0.303-in) gun in a dorsal turret, plus a bombload of 500 kg (1,102 lb)

The Caproni Ca 314 was the last and most widely built of the series, and was used in maritime roles as well as for ground attack.



ITALY

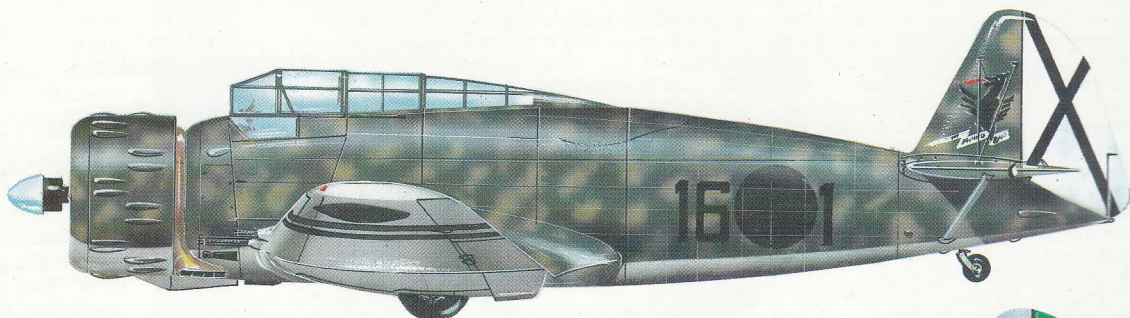
Breda Ba.65

Intended as an *aeroplano di combattimento*, capable of fulfilling the roles of interceptor fighter, light bomber, or reconnaissance/attack aircraft as required, the prototype **Breda Ba.65** made its initial flight in September 1935. Experience in Spain indicated that the Ba.65 was suited only to the attack role, and the type served thenceforth with most of the eight *squadriglie* attached to the two Regia Aeronautica assault *stormi* (wings), the 5º and 50º. A second series of 137 aircraft was built by Breda (80) and Caproni-Vizzola (57), before production ended in July 1939. They differed from the first production batch by having Fiat A.80 engines. Six Fiat-powered Ba.65s and four more of the Gnome-Rhône-powered version were sent to the Aviazione Legionaria in Spain in 1938.

Following Italy's entry into World War II in June 1940, Ba.65s were involved in the fighting in North Africa against the British. They had a low serviceability rate in desert conditions and put up an unimpressive performance. The last serviceable aircraft was lost during the British offensive in Cyrenaica in February 1941.

A large number of the Ba.65s serving with Italian units were of two-seat configuration, with an observer/gunner in an open cockpit above the trailing edge of the wing. A smaller number of the type had a Breda L type turret, but in either case the observer/gunner operated a single 7.7-mm (0.303-in) machine-gun. While offensive armament could theoretically comprise up to 1000 kg (2,205 lb) of bombs, the load usually carried was up to 300 kg (661 lb) in the fuselage bomb bay or, alternatively, up to 200 kg (441 lb) on underwing racks.

Exports included 25 Fiat-powered Ba.65 two-seaters to Iraq in 1938, two of them dual-control trainers and the remainder with Breda L turrets; 20 Ba.65s with Piaggio P.XI C.40 engines to Chile later in the same year, 17 of them single-seaters and three dual-control trainers; and 10 Fiat-powered two-seaters with Breda L turrets to Portugal in



This Breda Ba.65 was flown by the Aviazione Legionaria on the Nationalist side during the Spanish Civil War.



Spanish experience showed the Ba.65 to be suitable for ground attack only, although 25 two-seaters were sold to Iraq, where they served in No. 5 (Fighter) Squadron.

November 1939. A single Fiat-powered production aircraft was tested with an American Pratt & Whitney R-1830 engine in June 1937 in anticipation of an order from the Chinese Nationalist government, but this failed to materialize. The Iraqi Ba.65s saw limited action against the British during the 1941 insurrection in that country.

Specification

Breda 65/A.80 (single-seat version)

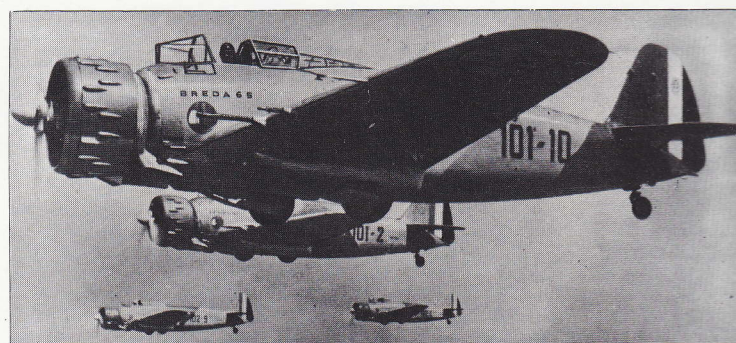
Type: ground-attack aircraft

Powerplant: one 746-kW (1,000-hp) Fiat A.80RC.41 radial piston engine

Performance: maximum level speed 430 km/h (267 mph); maximum level speed, two-seat version 410 km/h (255 mph); service ceiling 6300 m (20,670 ft); range 550 km (342 miles)

Weights: empty equipped 2400 kg (5,291 lb); maximum take-off 2950 kg (6,504 lb)

Dimensions: span 12.10 m (39 ft 8.4 in);



length 9.30 m (30 ft 6.1 in); height 3.20 m (10 ft 6 in); wing area 23.50 m² (252.96 sq ft)

Armament: two 12.7-mm (0.5-in) and two 7.7-mm (0.303-in) Breda-SAFAT fixed forward-firing machine-guns in wings, plus up to 300 kg (661 lb) of bombs in fuselage bomb-bay and up to

The Breda Ba.65 served with most of the eight squadrons of the two Regia Aeronautica assault Stormi (wings). These are from the original batch of 81 aircraft.

200 kg (441 lb) of bombs on underwing racks (usually alternatively)



ITALY

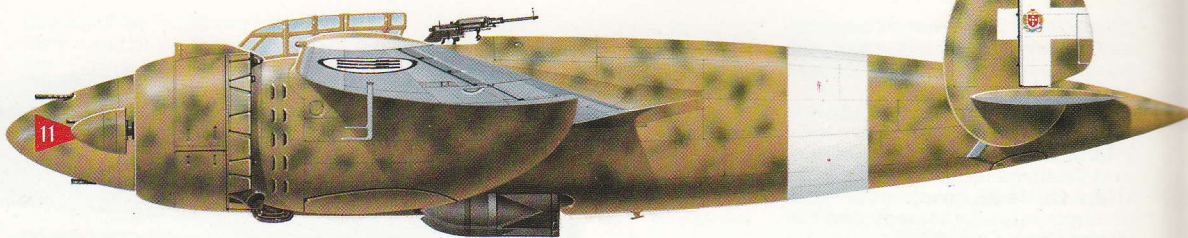
Breda Ba.88 Lince

A propaganda triumph when its appearance was trumpeted by Mussolini's Fascist regime in 1936, the **Breda Ba.88 Lince** (lynx) was a sleek all-metal shoulder-wing monoplane. In April 1937 it established two world speed-over-distance records. Regarded as an *aeroplano di combattimento*, suitable for attack, long-range reconnaissance or bombing operations, the Ba.88 then had its military equipment and weapons installed. Immediately, performance and flight characteristics fell off dramatically, but by then production orders were already being executed.

On 16 June 1940, just after Italy's declaration of war on France and her allies, the Ba.88 had its first taste of action. Twelve aircraft from the Regia Aeronautica's 19° Gruppo Autonomo made bombing and machine-gun attacks on the principal airfields of Corsica; three days later nine Ba.88s made a repeat attack. Analysis of these operations showed that the Ba.88 had only limited value, and any remaining doubts were settled when Ba.88s of the 7° Gruppo Autonomo joined action in Libya against the British. Fitted with sand filters, the engines overheated and failed to deliver their designed power. Attacks on targets at Sidi Barrani had to be aborted in September 1940, the aircraft failing to gain sufficient altitude or maintain formation, and reaching a speed less than half that claimed by the manufacturers.

By mid-November 1940 most surviving Ba.88s had been stripped of useful equipment and were scattered around operational airfields as decoys for attacking British aircraft.

Three Ba.88s were modified by the Agusta plant in 1942 to serve as ground-attack aircraft. Wing span was increased by 2.00 m (6 ft 6.75 in) to alleviate wing loading problems, their



A Breda Ba.88 of 7° Gruppo, 5° Stormo, based at Castel Benito in Libya.



engines were replaced by Fiat A.74s, nose armament was increased to four 12.7-mm (0.5-in) machine-guns, and dive brakes were installed. These Breda Ba.88Ms were delivered to the 103° Gruppo Autonomo Tuffatori (independent dive-bombing group) at Lonate Pozzolo on 7 September 1943. They were flight-tested by Luftwaffe pilots, but that was the last heard of the Breda Ba.88 which represented, perhaps, the most remarkable failure of any operational aircraft to see service in World War II.

Specification

Breda Ba.88

Type: fighter-bomber/reconnaissance

aircraft

Powerplant: two 746-kW (1,000-hp) Piaggio P.XI RC.40 radial piston engines

Performance: maximum speed 490 km/h (304 mph); service ceiling 8000 m (26,245 ft); range 1640 km (1,019 miles)

Weights: empty 4650 kg (10,251 lb); maximum take-off 6750 kg (14,881 lb)
Dimensions: span 15.60 m (51 ft 2.2 in); length 10.79 m (35 ft 4.8 in); height 3.10 m (10 ft 2 in); wing area 33.34 m² (358.88 sq ft)

Armament: three fixed forward-firing 12.7-mm (0.5-in) Breda-SAFAT machine-guns in nose and one 7.7-mm (0.303-in) Breda-SAFAT machine-gun

In spite of its sleek, powerful appearance, the Ba.88 was somewhat less than successful, since the excellent prototype performance declined dramatically once in operational trim. Indeed, so bad was the Lince's combat performance that within five months from the start of the war survivors of the initial batch of 80 were gutted and used as ground decoys on airfields.

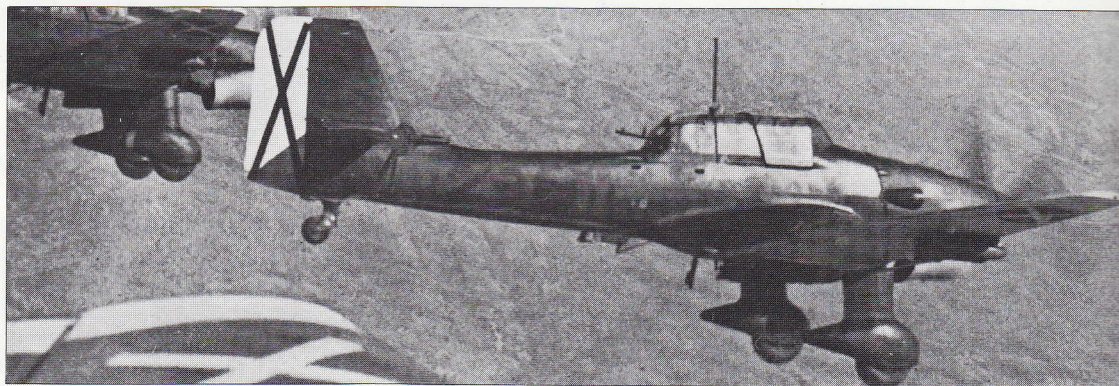
on trainable mounting in rear cockpit, plus up to 1000 kg (2,204 lb) of bombs in fuselage bomb-bay or, alternatively, three 200-kg (441-lb) bombs carried semi-exposed in individual recesses in the fuselage belly



GERMANY

Junkers Ju 87

Forever deprecated as a Nazi terror weapon, the **Junkers Ju 87** (widely referred to as the Stuka – a contraction of the word *Sturzkampfflugzeug*) was nevertheless an imaginative weapon of considerable accuracy when operating in skies clear of enemy fighters. Conceived as a form of support artillery for the Wehrmacht's Blitzkrieg tactics, the Ju 87 was first flown in 1935, a small number of Ju 87A-1s and Ju 87B-1s being flown by the Legion Condor in Spain in 1938-9. To support the invasion of Poland the Luftwaffe fielded all five *Stukageschwader* thus far equipped with Ju 87s, and it was in this campaign that, with little effective opposition in the air, the Stuka's legend was born. With sirens screaming, the cranked-wing dive-bombers wrought havoc among Poland's helpless troops and civilians, effectively destroying the country's lines of communications, bridges, railways and airfields. During the difficult Norwegian campaign the Ju 87R with underwing fuel tanks was introduced to cope with the great distances involved, and in the Battle of Britain this version and the Ju 87B were heavily committed until withdrawn temporarily as a result of losses suffered at the hands of British fighter pilots. At the end of 1941 the Ju 87D, a much cleaned-up version with an up-rated Jumo 211, entered service on the



Russian front, and appeared in North Africa the following year. The Ju 87G, a specialist anti-tank aircraft, featured a pair of 37-mm guns under the wings and achieved spectacular success, particularly in the East. Unquestionably the greatest exponent of the Stuka was Hans-Ulrich Rudel whose personal tally of a battleship, cruiser and a destroyer sunk, and 519 tanks destroyed, far exceeded any other. Total Ju 87 production was said to be 5,709.

Specification

Junkers Ju 87D-1

Type: two-seat dive-bomber/assault

aircraft

Powerplant: one 1044-kW (1,400-hp) Junkers Jumo 211J-1 inverted-Vee piston engine

Performance: maximum speed 410 km/h (255 mph) at 3840 m (12,600 ft); cruising speed 320 km/h (199 mph) at 5090 m (16,700 ft); service ceiling 7290 m (23,915 ft); maximum range 1535 km (954 miles)

Weights: empty equipped 3900 kg (8,598 lb); maximum take-off 6600 kg (14,551 lb)

Dimensions: span 13.80 m (45 ft 3.3 in); length 11.50 m (37 ft 8.75 in); height 3.90 m (12 ft 9.5 in); wing area 31.90 m²

The Stuka established its reputation in the hands of the Condor Legion in Spain. Here a formation of Ju 87B-1s approaches its target.

(343.38 sq ft)

Armament: two 7.92-mm (0.31-in) forward-firing MG 17 machine-guns in wings and twin 7.92-mm (0.31-in) MG 81Z machine-guns in rear cockpit, plus a maximum bombload of one 1800-kg (3,968-lb) bomb beneath fuselage, or various alternative loads beneath fuselage and wings, including anti-personnel bombs

Blitzkrieg Bomber

The Junkers Ju 87 Stuka became the symbol of the Blitzkrieg, its deadly, accurate dive-bombing rendered even more terrifying by the addition of sirens to the landing gears. It later became a fearsome anti-tank weapon.

Designed by Dipl. Ing. Hans Pohlmann in 1934, the Junkers Ju 87 was a remarkable weapon, destined to become the most hated manifestation of German ruthlessness in the years of Blitzkrieg during 1939-41. Yet it was a weapon conceived in the belief that Germany's armed forces would conquer and dominate Europe within the space of two years while no effective opposition could be mustered to contest the Luftwaffe's supremacy in the air. So long as there was no such opposition, the Stuka (contracted from *Sturzkampfflugzeug*) proved to be an extremely accurate weapon, capable of striking relatively small fixed targets when delivering its bombs from a steep fixed-path dive. It was in effect intended for use as highly mobile battlefield artillery and as such was an integral part of the panoply of Blitzkrieg and, representing the spearhead of Goering's powerful Luftwaffe, the elite *Stukageschwader* came to be staffed by many favoured members of the Prussian aristocracy in positions of senior command.

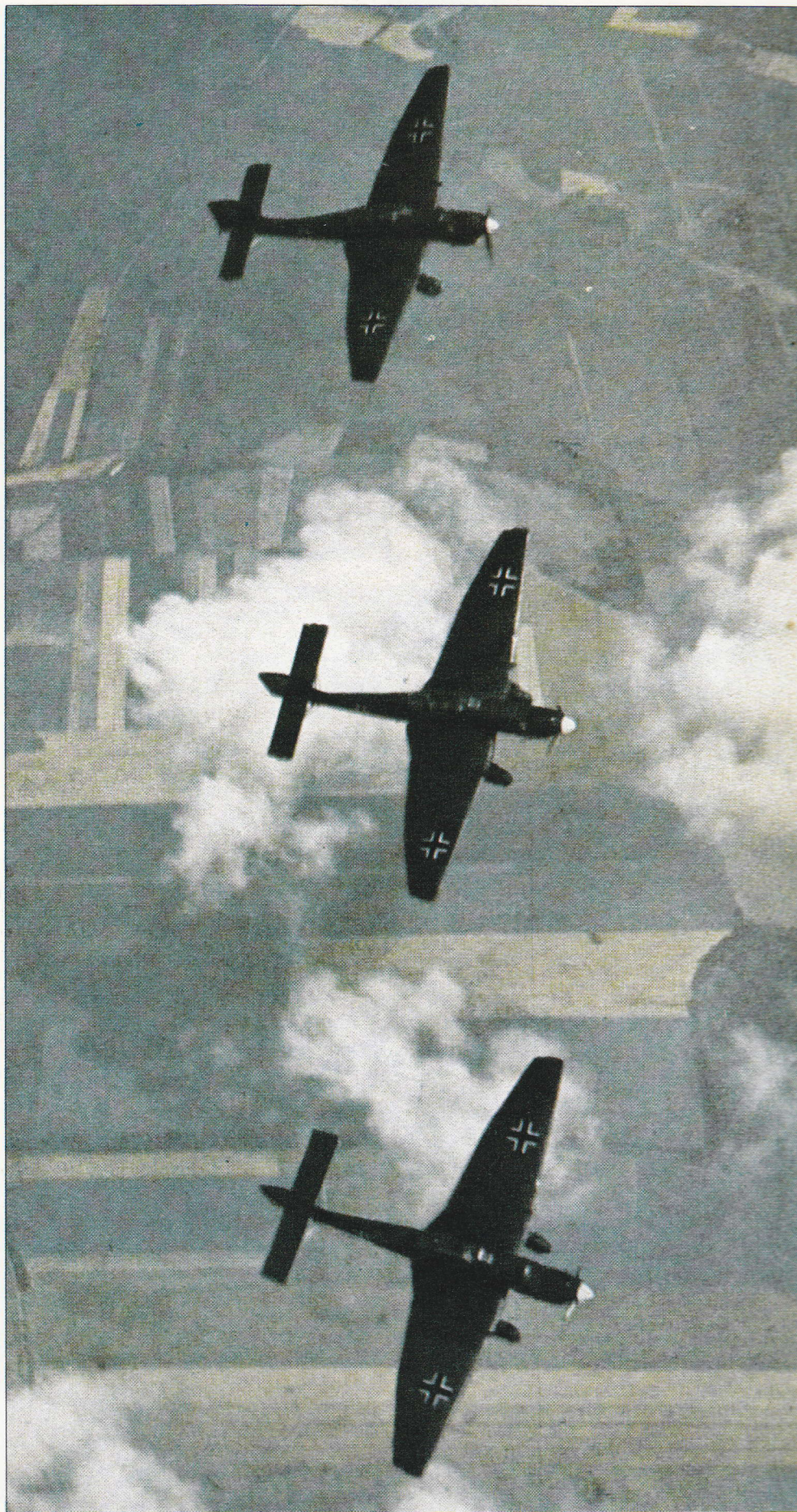
When the Luftwaffe embarked on what was intended to be the bombardment leading to a cross-Channel invasion of the British Isles in 1940, however, Ju 87 formations were set upon by British fighters with devastating effect long before even the half-way stage had been reached. Goering felt obliged to withdraw almost all his *Stukagruppen* from the battle to conserve his 'air artillery' for the final land battle, which was never fought.

Dive-bomber units

Creation of the Ju 87 *Sturzkampffliegerverbände* (dive-bombing units) took place during 1937-8, the first Ju 87A-1s being entrusted to I/StG 162 'Immelmann' for evaluation and evolution of combat tactics; three of the unit's aircraft were sent to Spain where, with little effective fighter opposition by the Republican forces, they proved highly effective in their role as 'air artillery'. Guiding light of the Stuka concept at this time was the famous German pilot, Ernst Udet, then heading the Luftwaffe's Technische Amt (technical administration). Following the success in Spain, Wolfram Freiherr von Richthofen, who had originally considered the Ju 87 to be too slow and vulnerable in modern combat but who eventually commanded German forces in Spain, joined Udet in his enthusiasm for the aircraft.

Despite what became known as the Neuhammer Disaster (when 13 Ju 87 crews of I/StG 76 were killed on 15 August 1939 during a dive-bombing rehearsal for the attack on Poland, when fog suddenly obscured the ground near Sagan), the *Stukagruppen* continued to multiply, so that by the date of Germany's attack on Poland the Luftwaffe fielded nine such *Gruppen*. Not only were they instrumental in destroying much of the Polish air

While the Messerschmitt Bf 109s kept Allied fighters at bay, the Stukas had a field day over France and the Low Countries, leading Allied ground troops to wonder where their aircraft had got to.



Blitzkrieg Bomber

force on its airfields, but succeeded also in blocking numerous bridges as well as sinking two Polish warships in Hela harbour on 3 September. A number of successful attacks on British shipping during the Norwegian campaign of April and May 1940 brought the first awards of the Knight's Cross to Ju 87 pilots Gerhard Grenzel, Paul-Werner Hozzel, Martin Möbus and Elmar Schaefer (all of StG 1).

The German attack in the West, which opened on 10 May of that year, was accompanied by frequent dive-bombing attacks in support of the advancing German armoured columns. The relatively small number of occasions on which Stuka attacks upon legitimate military targets, such as road bridges, involved widespread casualties among the crowds of fleeing civilians, merely fuelled the accusations that the hated dive-bombers were being deliberately used to spread terror. Nevertheless, despite the inevitable loss of life among the civilians who congested the roads in the path of the advancing Panzers, the Germans did employ sirens (the 'trumpets of Jericho') in their Ju 87s with the obvious purpose of terrorizing those on the ground. Despite the frequent involvement over the battlefields of British and French fighters, which were usually kept at bay by the excellent Messerschmitt Bf 109E escorts, the Ju 87 managed over France to perpetuate its myth of invincibility.

Stuka in the Battle of Britain

The Stuka's fortunes changed radically during the great Battle of Britain when it became necessary to provide strong fighter escort for almost every raid by German bombers, with the inevitable result that seldom more than a token screen of fighters was available to protect the vulnerable dive-bombers. With only limited range available to the Stuka, its attacks were confined to the southern fringe of England, and between 8 and 18 August a number of

Ju 87Bs of StG 2 'Immelmann' parade at a Balkan airstrip during 1941. Stukas took a heavy toll of Royal Navy vessels off Crete; indeed, the Stuka is credited with sinking more ships than any other aircraft in history. Stukas carried an automatic dive control set by the pilot to a chosen pull-out height.



heavy raids (occasionally devastating) were launched, particularly on the airfields at Tangmere, Lympne and Hawkinge, on the naval bases at Portland and Portsmouth, and on the radar stations at Ventnor, Poling, Dungeness and Dover. The greatest efforts, however, were made to destroy British coastal convoys, notably Convoy Peewit on 8 August, Convoy Booty on 11 August, and Convoys Agent and Arena on 12 August. It was in a series of heavy dive-bombing attacks on targets between Selsey Bill and the Isle of Wight on 18 August that the Stukas suffered their heaviest casualties, StG 77 alone losing 17 aircraft (more than 50 per cent of the attacking force). The loss of 66 dive-bombers and their crews in 10 days, added to more than a dozen in the previous month, represented about a quarter of the entire *Stukaverbände* in the West, and decided Goering on withdrawal of the Ju 87 from the

The usual load of a Ju 87B was an SC500 500-kg (1,100-lb) bomb mounted on crutches, which swung out from the belly to release the weapon at a safe distance from the propeller.

attack on the UK, although isolated raids, particularly in the Thames estuary, continued for some weeks.

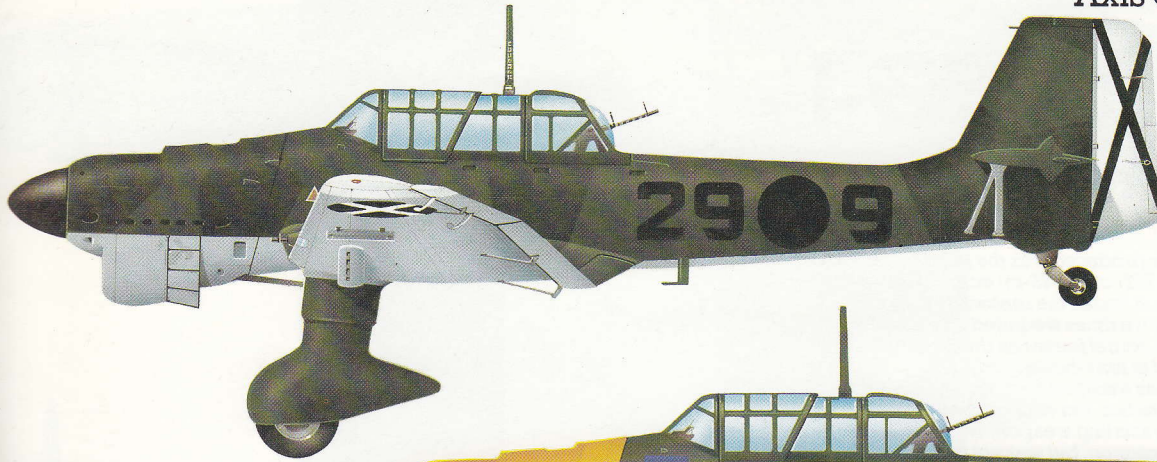
If the Battle of Britain represented the Luftwaffe's first major setback of the war, it also constituted a sharp reminder of the Ju 87's fatal flaw when confronted by determined fighter pilots, to whom the steadily diving Stuka was a dead duck in their gunsights.

Mediterranean operations

In January 1941 two *Stukagruppen*, I/StG 1 under Hozzel and II/StG 2 'Immelmann' led by Walter Enneccerus (who had won the Knight's Cross following the French campaign), began

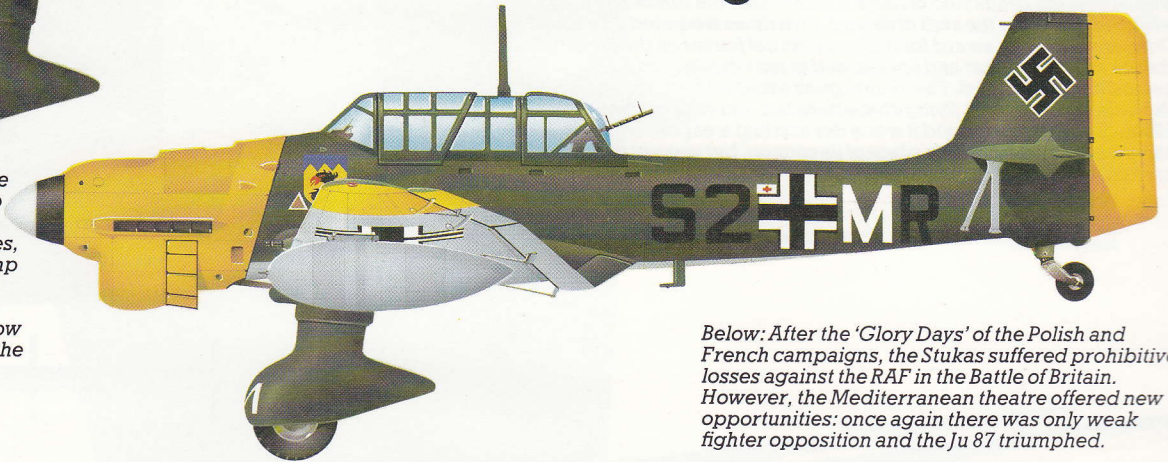


Axis Ground Attack Aircraft



Possibly the first Ju 87B to drop bombs in action, this early B-1 model served in Spain with the *Staffel Jolanthe*, a very active unit of the *Legion Condor*. The direct injection fuel system of the *Jumo 211Da* engine fitted to the B-1 prevented engine-cuts in inverted flight or negative-g manoeuvres.

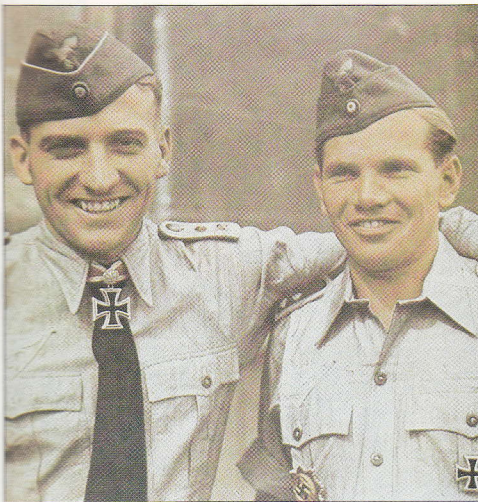
Right: The Ju 87R was a long-range version with two 300-litre (66-imp gal) external fuel tanks under the wings, outboard of the dive brakes, with an additional 150-litre (33-imp gal) tank in each outer wing. This machine flew with *7./StG 77* in the Balkans from early 1941. The yellow areas were theatre markings for the Eastern Front.



Below: After the 'Glory Days' of the Polish and French campaigns, the Stukas suffered prohibitive losses against the RAF in the Battle of Britain. However, the Mediterranean theatre offered new opportunities: once again there was only weak fighter opposition and the Ju 87 triumphed.

operating in the central Mediterranean, embarking on a string of successes by hitting and crippling the carrier HMS *Illustrious* at Malta on 10 January and sinking the cruiser HMS *Southampton* on the following day. Indeed Enneccerus was to gain a considerable reputation as a 'ship killer', his *Gruppe* later hitting the carrier HMS *Formidable* and destroyer HMS *Nubian* in May, the month in which the cruiser HMS *Gloucester* was sent to the bottom by the Ju 87s of *1./StG 2*.

As with all branches of the Luftwaffe, the *Stukaverbände's* greatest trials and achievements accompanied Germany's mammoth campaign in the East, compared with which all previous triumphs and tribulations paled to relative obscurity. Of all those achievements none approached the extraordinary prowess of one man, Hans-Ulrich Rudel, unquestionably the most illustrious of all Germany's Stuka



Above: Hitler's favourite pilot, Hans-Ulrich Rudel, was Germany's most highly decorated officer, sole holder of the Golden Oak Leaves to the Knight's Cross. He flew 2,530 combat missions in the Stuka, was credited with over 500 Soviet tanks destroyed, and was himself shot down 30 times.

Blitzkrieg Bomber

Junkers Ju 87G-1

The last combat model of the Ju 87 to be produced was the Ju 87G-1 anti-tank version, carrying a pair of Flak 18 BK 3.737- cm (1.45-in) guns. This variant was largely the brainchild of Hans-Ulrich Rudel, the renowned Stuka pilot whose exploits are the stuff of legend. Five times wounded and recipient of Germany's highest award for gallantry, Rudel fought on the Eastern Front for the duration of the war and specialized in tank-busting missions as the Soviets gained the upper hand. The 37-mm guns weighed over 363 kg (800 lb) and did little for the Stuka's flying characteristics, but with a muzzle velocity of 850 m (2,789 ft) per second it was a devastating weapon. The Ju 87G-1 could carry a useful bombload in place of its cannon, but was not fitted with dive brakes.





Blitzkrieg Bomber

pilots, despite the fact that the now-ageing Ju 87 had already been shown to be fatally flawed.

Rudel had originally been trained as a Ju 87 observer/gunner before the war, but by the launch of Operation 'Barbarossa' (the attack on the USSR) had reached the rank of Oberleutnant as a pilot of I/StG 2 on the central sector of the front. On the first day of the campaign he flew his first four combat missions.

In an attack on the Soviet island naval base at Kronstadt, flying as technical officer of III/StG 2, Rudel scored a direct hit on the old Soviet battleship *Marat*, causing it to partially capsize; in later attacks on the base he also sank a cruiser and a destroyer. Shortly afterwards he was awarded the Honorary Cup and German Cross in Gold, and in January 1942 received the Knight's Cross having flown more than 400 combat missions, almost all of them in the Ju 87B. After a spell as *Staffelkapitän* of 9./StG 2 in the Caucasus and Black Sea sector in mid-1942 he was transferred to 1 Staffel as its *Staffelkapitän*, also in the Southern Sector, and on 10 February 1943 completed his 1,000th combat mission.

Anti-tank version

During the spring of 1943 Rudel began flying the dedicated anti-tank version of the Stuka, the Ju 87G with two 37-mm guns, with this type destroying some 70 Soviet landing craft in the operations over the Kuban bridgehead. At the time of the great battle of armour at Kursk he introduced the Ju 87G to the Belgorod sector, destroying 12 T-34 tanks in the course of his first day's operations. By the end of October his personal score of tanks destroyed stood at around 100, the award of the Oak Leaves earlier in the year being followed by the Swords on 25 November. In January 1944 he participated in the Battle of Kirovograd, taking a heavy personal toll of tanks of the Soviet 67th Tank Brigade.

In February he was appointed to command III/StG 2 and promoted major. On 20 March he

Even at the outbreak of war, the Ju 87 was recognized by the Luftwaffe as a dated design which would need replacement, but its stunning success in the first years of the war ensured that production would continue. Its influence was so great that subsequent bombers like the Dornier Do 217 and Heinkel He 177 were mistakenly designed for dive-bombing.

flew eight sorties but in the course of the last, following an attack on a bridge over the Dniestr river, he spotted a Ju 87 of his unit that had force landed in enemy-held territory and landed alongside to pick up its crew. His own aircraft became bogged down so he was forced to swim the river, despite being shot in the shoulder, to regain the German lines 50 km (31 miles) distant. His observer, Erwin Hentschel (holder of the Knight's Cross and veteran of 1,490 missions), drowned in the river.

Gallantry award

On 29 March Rudel was awarded the Diamonds to the Knight's Cross, and at the beginning of June, when he was flying operations near Yassy in Romania, his tally of enemy tanks destroyed reached 300 and the number of sorties flown topped the 2,000 mark. The last nine months of the war were punctuated by short visits to hospital following wounds suffered in combat. In October 1944 he took over command of StG 2 'Immelmann' as an Oberstleutnant and, following a bullet wound in the thigh, 'escaped' from a Hungarian hospital to rejoin his unit in a plaster cast. On New Year's Day 1945 Rudel was summoned by Hitler himself to receive the unique award of the Golden Oak

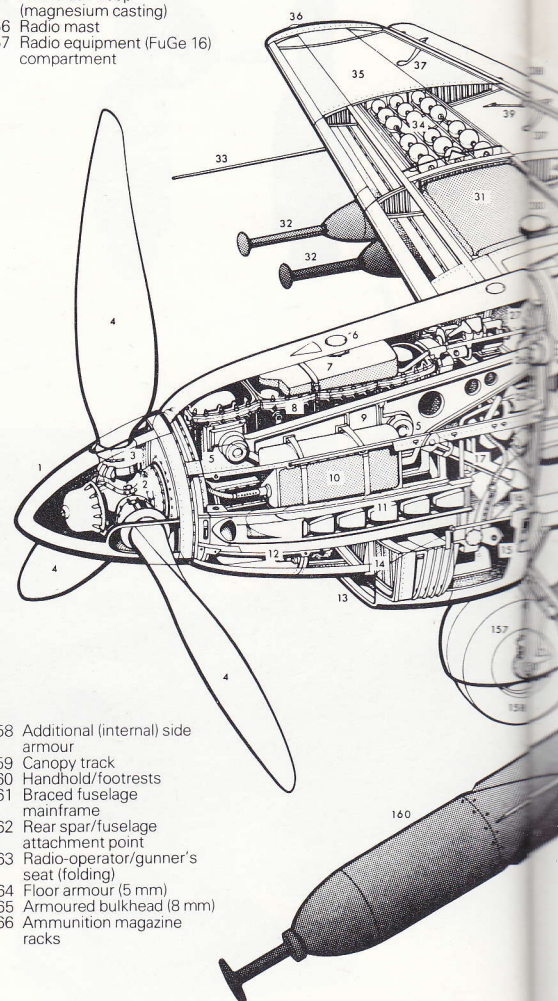
Leaves to the Knight's Cross, having destroyed 463 Soviet tanks and completed 2,400 missions.

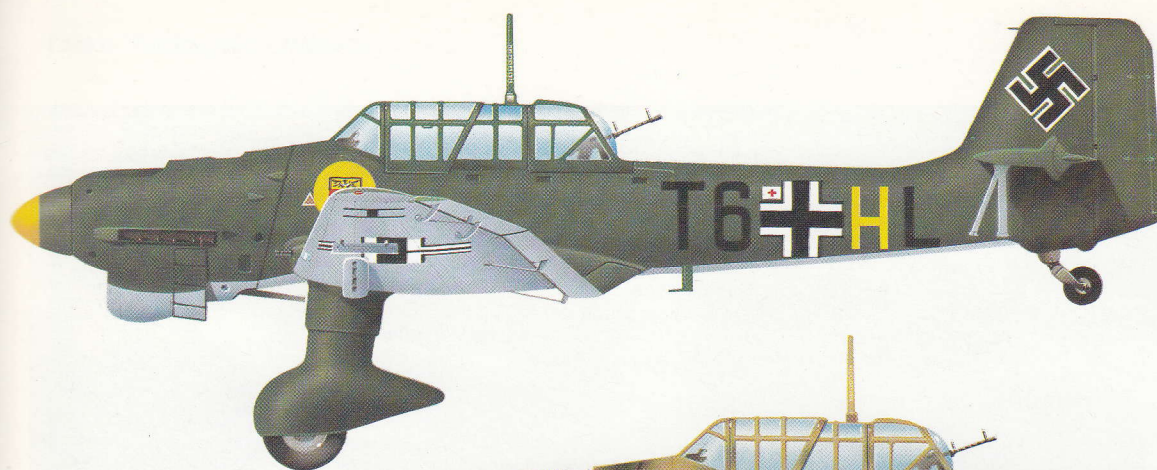
Rudel narrowly escaped death on 8 February 1945 when his Ju 87 was hit by 40-mm flak near Lebus, and he was wounded in the leg. His gunner, *Geschwaderarzt* Dr Ernst Gadermann, saved him from bleeding to death, but shortly afterwards he had to have his right foot amputated at a Waffen SS hospital. Nevertheless, despite an open wound, Rudel returned to his *Geschwader* six weeks later and resumed flying, destroying 26 further Soviet tanks before the war ended. His final tally of 2,530 combat missions and score of 519 tanks destroyed (plus 800 other vehicles and the naval vessels sunk, nine air victories and countless other targets destroyed) placed him in a category of his own among the combat pilots of history. He had been shot down no fewer than 30 times, had rescued six aircrew members from hostile territory and had been wounded five times.

Yet Rudel's personal experiences and achievements, astonishing as they were, symbolized the bitterness of the fighting in the East no less than the extraordinary tenacity with which the *Stukaverbände* flew their Ju 87s in the inexorably changing battles against the Soviet armies.

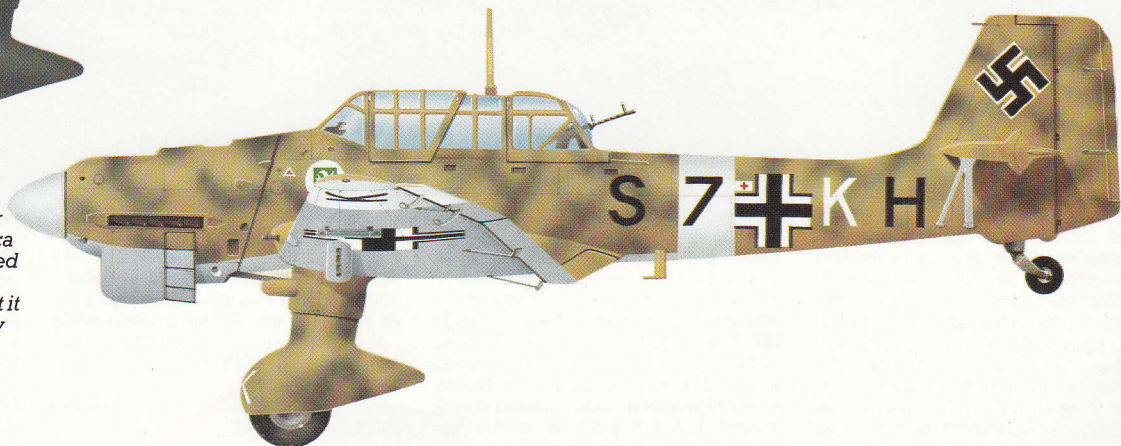
Junkers Ju 87D-3 cutaway drawing key

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|---|---|--|---|
| 1 Spinner | 24 Heating point | 67 Pilot's seat (reinforced with 4-mm side and 8-mm rear armour) | 67 Additional (external) side armour with cut-out for hand grip |
| 2 Pitch-change mechanism housing | 25 Auxiliary air intake | 48 Inter-cockpit bulkhead | 68 Internal side and head armour |
| 3 Blade hub | 26 Ball joint bulkhead fixing (upper) | 49 Sliding canopy handgrip | 69 Sliding canopy section (shown part open) |
| 4 Junkers VS 11 constant-speed propeller | 27 Bulkhead | 50 External side armour | 70 Ring-and-bead sunights |
| 5 Anti-vibration engine mounting attachments | 28 Oil tank (6.8 Imp gal/31 litre capacity) | 51 Pilot's back armour (8 mm) | 71 Twin 7.92-mm Mauser MG 81Z machine-gun on GSL-K 81 mount |
| 6 Oil filler point and marker | 29 Oil filler point and marker (Intava 100) | 52 Headrest | |
| 7 Auxiliary oil tank (5.9 Imp gal/26.8 litre capacity) | 30 Fuel filler cap | 53 Aft-sliding cockpit canopy (shown part open) | |
| 8 Junkers Jumo 211J-1 12-cylinder inverted-vee liquid cooled engine | 31 Self-sealing starboard outer fuel tank (33 Imp gal/150 litre capacity) | 54 Radio mast cut-out | |
| 9 Magnesium alloy forged engine mount | 32 Underwing bombs with <i>Dienartstab</i> percussion rods | 55 Anti-crash hook (magnesium casting) | |
| 10 Coolant (Glysantin-water) header tank | 33 Pitot head | 56 Radio mast | |
| 11 Ejector exhaust stubs | 34 Spherical oxygen bottles | 57 Radio equipment (FuGe 16) compartment | |
| 12 Fuel injection unit housing | 35 Wing skinning | | |
| 13 Induction air cooler | 36 Starboard navigation light | | |
| 14 Armoured radiator | 37 Aileron mass balance | | |
| 15 Inertia starter cranking point | 38 'Double wing' aileron and flap (starboard outer) | | |
| 16 Ball joint bulkhead fixing (lower) | 39 Aileron hinge | | |
| 17 Tubular steel mount support strut | 40 Corrugated wing rib station | | |
| 18 Ventral armour (8 mm) | 41 Reinforced armoured windscreen | | |
| 19 Main oil tank (9.9 Imp gal/45 litre capacity) | 42 Reflector sight | | |
| 20 Oil filling point | 43 Padded crash bar | | |
| 21 Transverse support frame | 44 Signal flare tube | | |
| 22 Rudder pedals | 45 Braced fuselage mainframe | | |
| 23 Control column | 46 Front spar/fuselage attachment point | | |





A Ju 87B-2 is seen in Luftwaffe Mediterranean camouflage, with white theatre band. This particular Stuka flew with 1./StG 3 in Cyrenaica in 1942. Stukas had earlier appeared in North Africa in Italian hands, leading to the erroneous belief that it was being manufactured in Italy by Breda.



Meeting effective fighter opposition came as a disagreeable surprise to the Stukas deployed against Britain in 1940. Forty-one were shot down in the period 13-18 August, and on 19 August the Stukas were withdrawn from the battle. This Ju 87B-2 crash-landed near Selsey on 16 August after bombing Tangmere. Assigned to 3./StG 2 'Immelmann', it sports the Gruppe emblem and the coat of arms of the city of Breslau.

- 72 Canopy track fairing
- 73 Peil G IV D/F equipment
- 74 Circular Plexiglas access panel
- 75 Back-to-back L-section stringers (fuselage horizontal break)
- 76 First-aid stowage
- 77 Z-section fuselage frames
- 78 Radio aerial
- 79 Fairled elevator mass balance
- 80 Starboard elevator
- 81 Tailplane structure
- 82 Tailplane brace/spar attachment point

- 83 Tailplane bracing strut
- 84 Fuselage skinning
- 85 Control runs
- 86 Tailfin attachment fairing
- 87 Tailfin structure
- 88 Rudder horn balance

- 89 Rudder
- 90 Rudder trim tab controls
- 91 Rudder trim tab
- 92 Rudder control linkage

- 93 Rudder post
- 94 Rear navigation light
- 95 Elevator tab
- 96 Port elevator
- 97 Fairled elevator mass balance
- 98 Tailplane front spar
- 99 Control pulley circular access panels

- 100 Rudder lower hinge fairing
- 101 Tailplane bracing strut
- 102 Emergency tailskid
- 103 Tailwheel
- 104 Tailwheel leg
- 105 Jacking point
- 106 Fuselage stringers
- 107 Master compass
- 108 Crew entry step (port and starboard)
- 109 Entry support (with control run cut-outs)
- 110 Wing root fairing

- 111 Non-slip walkway (aft section external metal strakes)
- 112 Fuel filler point
- 113 Non-slip walkway (forward section composite surface)
- 114 Leading-edge structure
- 115 Self-sealing port inner wing fuel tank (52.8 Imp gal/240 litre capacity)
- 116 Wing-joint external cover strip
- 117 Ball-and-socket wing attachment points
- 118 Armoured coolant radiator (port and starboard)
- 119 Inboard flap structure
- 120 Flap hinge
- 121 Rheinmetall-Borsig MG 17 machine gun of 7.92-mm calibre (port and starboard)
- 122 Ammunition tank (1000 rounds capacity) inboard of rib
- 123 Port outer self-sealing fuel tank (33 Imp gal/150 litre capacity)

- 124 Corrugated wing rib
- 125 ETC bomb rack support bar
- 126 ETC bomb rack underwing fairing
- 127 Port outboard flap
- 128 Port aileron
- 129 Aileron mass balance
- 130 Rear spar
- 131 Wing rib
- 132 Port navigation light
- 133 Front spar
- 134 Wing leading edge
- 135 Undervwing bomb load (two 110-lb/50-kg bombs) on multi-purpose carrier
- 136 Bomb shackles
- 137 Dienartstab percussion rod attachments
- 138 ETC 50/VIII fairing
- 139 Air brake (extended)
- 140 Air brake activating mechanism
- 141 Air brake (retracted)
- 142 Landing lamp
- 143 Wheel spat
- 144 Fork/spat attachment
- 145 Port mainwheel
- 146 Brake reservoir filler point
- 147 Cantilever fork
- 148 Leather shroud
- 149 Oleo-pneumatic shock absorber
- 150 Mainwheel leg
- 151 Siren fairing
- 152 Barrel of MG 17 machine gun
- 153 Wind-driven siren
- 154 Starboard wheel spat
- 155 PVC ventral bomb rack
- 156 Bomb cradle
- 157 Starboard wheel fork
- 158 Starboard mainwheel
- 159 Bomb release trapeze
- 160 551-lb (250-kg) bomb with Dienartstab attachment

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GERMANY

Junkers Ju 88P

Although the **Junkers Ju 88** was originally intended to perform the dual roles of level and dive bombing, the early versions were seldom employed in the ground-support role in the same manner as the Ju 87 dive-bomber, being largely confined to level bombing attacks for which its excellent performance rendered it ideally suited. It was not until 1942, with the increasing ferocity of fighting on the Eastern Front, that attention focussed on a dedicated ground-attack version, the **Ju 88P**. The prototype **Ju 88P V1**, modified from a standard Ju 88A-4, featured a single 75-mm (2.95-in) KwK 39 gun housed in a large fairing under the fuselage, and during trials against captured T-34 tanks at Rechlin in 1943 promising results were obtained. A small number of **Ju 88P-1** aircraft followed, featuring the 'solid' nose of the C-series *Zerstörer*, armour protection for the engines and the more suitable semi-automatic PAK 40L 75-mm anti-tank gun; production amounted to about 40 aircraft, these being distributed between the Versuchskommando für Panzerbekämpfung, the Panzerjägerstaffel 92 and 6./KG 3 for operational trials and development of tactics as train-busters, this role becoming increasingly important on the Eastern Front.

The Ju 88P-1 proved both cumbersome and vulnerable, and was soon followed by the **Ju 88P-2** with a large fairing offset to port under the fuselage mounting a pair of 37-mm BK 3.7 cannon. The higher muzzle velocity proved more effective against Soviet armour and also prompted the air-



craft's use by Erprobungskommando 25 as a bomber-destroyer; the aircraft had lost the necessary manoeuvrability for air combat, however. The **Ju 88P-3**, with further increased armour protection for the crew, was delivered to one *Staffel* in each of the *Nachtschlachtgruppen* (night ground-attack groups) 1, 2, 4, 8 and 9 for combat use on the Eastern Front, in northern Norway (NSGr 8) and Italy (NSGr 9). Some success was achieved by these units, but in an effort to improve the aircraft's performance the **Ju 88P-4** was introduced with a much smaller gun fairing mounting a single 50-mm BK5 gun, and at least one Ju 88P-4 was equipped with a 6.5-cm RZ 65 solid-fuel rocket-launcher with a 22-round magazine. The Ju 88P-4 was also planned to mount

an 88-mm Dika 8.8 U-boat gun as well as various types of flame-thrower; none of these reached operational units, however, and by the time that NSGr 2 was moved to the West late in 1944 few, if any, Ju 88Ps remained in service.

Specification

Junkers Ju 88P-3

Type: three-crew ground attack aircraft

Powerplant: 999-kW (1,340-hp) Junkers Jumo 211J-2 inverted V-12 piston engines

Performance: maximum speed 360 km/h (224 mph) at 1600 m (5,250 ft); climb to 2700 m (8,860 ft) in 10.6 minutes; service ceiling about 5500 m (18,045 ft); normal range 1580 km (982

*The Junkers Ju 88P-3 featured increased armour protection for the crew and it packed a devastating punch of twin 37-mm cannon in the ventral fairing. It was delivered to five *Nachtschlachtgruppen*.*

miles)

Weights: empty about 11080 kg (24,427 lb); maximum take-off about 12670 kg (27,932 lb)

Dimensions: span 20.00 m (65 ft 7.5 in); length 14.85 m (48 ft 8.5 in); height 4.85 m (15 ft 11 in); wing area 54.56 m² (587.30 sq ft)

Armament: two 37-mm BK Flak 18 cannon in a fairing under the front fuselage, and up to six 7.92-mm (0.31-in) MG 17 machine-guns on trainable mountings in the cockpit



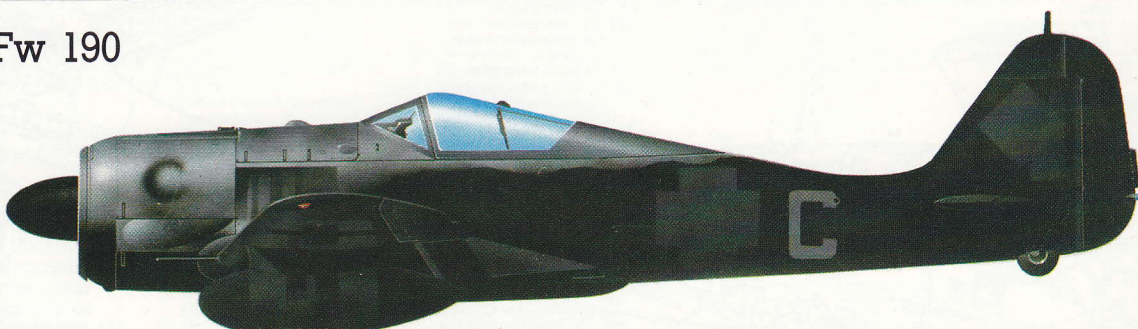
GERMANY

Focke-Wulf Fw 190

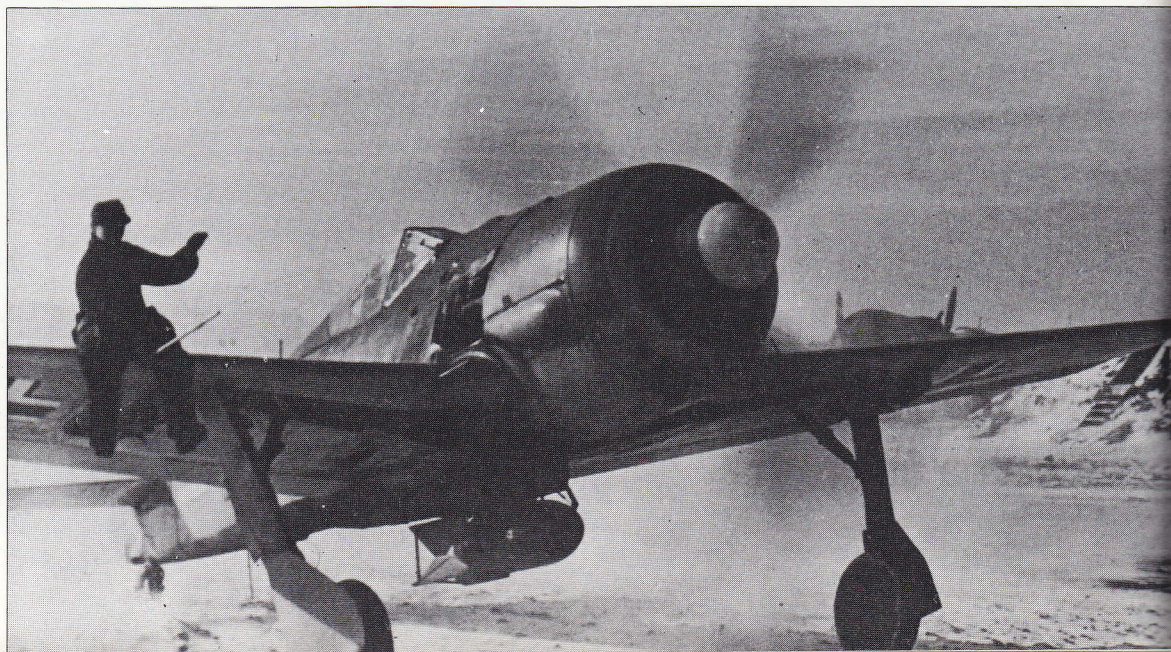
A cantilever low-wing monoplane of stressed-skin construction, the prototype **Focke-Wulf Fw 190** was rolled out in May 1939 and the first flight took place on 1 June 1939. A second aircraft, the Fw 190 V2, flew in October 1939, armed with two 13-mm (0.51-in) MG 131 and two 7.92-mm (0.31-in) MG 17 machine-guns. Initial production version was the Fw 190A-1 which, flown by 6./JG 26, first clashed with RAF Supermarine Spitfires on 27 September 1941. Fighter-bomber versions included the **Fw 190A-5/U6** and the long-range **Fw 190A-5/U8**, and the **Fw 190A-5/U11** close-support aircraft carried a 30-mm MK 103 cannon beneath each wing. The **Fw 190A-5/U14** and **Fw 190A-5/U15** were both torpedo-bomber variants, able to carry an LT F5b and LT 950 torpedo respectively, and a 30-mm MK 108 cannon mounted in the outboard wing position was standard for the **Fw 190A-5/U16**.

In late 1943 several Fw 190A-7s were modified by the installation of Junkers Jumo 213A V-12 engines to serve as **Fw 190D-0** prototypes. Thus was derived the **Fw 190D-9** production version, known popularly as the 'long-nose 190' or 'Dora 9'. A 300-litre (66-imp gal) drop tank or a 250-kg (551-lb) bomb could be carried on each underwing rack. Variants included the **Fw 190D-12**, which was essentially a ground-attack aircraft with additional

The Fw 190 was modified to produce a series of highly successful fighter-bombers. This taxiing Fw 190A-5/U8 carries a crew member to give guidance to the pilot inside.



The Focke-Wulf Fw 190A-5/U8 was the long-range fighter bomber variant of the Fw 190A-5 introduced in early 1943. Engine overheating, which had been a problem with previous models, had been overcome by the introduction of a new mounting which positioned the engine further forward.



armour protection for the engine, and armed with two MG 151/20s in the wings and a single Mk 108 cannon firing through the spinner. However, the Fw 190D had been preceded into service by the **Fw 190F-1**, a specialized ground-attack version which was introduced in early 1943; generally similar to the Fw 190A-4, it differed by having additional armour protection for the cockpit and powerplant, the outboard 20-mm cannon deleted, and an ETC 501 bomb rack installed beneath the fuselage. The **Fw 190F-2** introduced a bubble canopy, and the **Fw 190F-3** could carry a 250-kg (551-lb) bomb beneath the fuselage and, in the **Fw 190F-3/R1** and **Fw 190F-3/R3** versions, four ETC 50 underwing bomb racks or two similarly-located 30-mm MK 103 cannon. The **Fw 190F-8/U2** and the **Fw 190F-8/U3** were fitted with the TSA bomb sight for anti-shipping strikes with, respectively, a 700-kg (1,543-lb) BT 700 or a 1400-kg (3,086-lb) BT 1400 weapon. Alphabetically the

last of the Fw 190s, and a specialized ground-attack version like the F-series which it preceded into service, the **Fw 190G-1** fighter-bomber was derived from the Fw 190A-5, but carried a 1800-kg (3,968-lb) bomb which necessitated the introduction of strengthened landing gear; wing-mounted armament was reduced to two MG 151/20 cannon, and the Junkers-designed wing racks accommodated two 300-litre (66-lmp gal) drop tanks.

Specification

Focke-Wulf Fw 190D-9

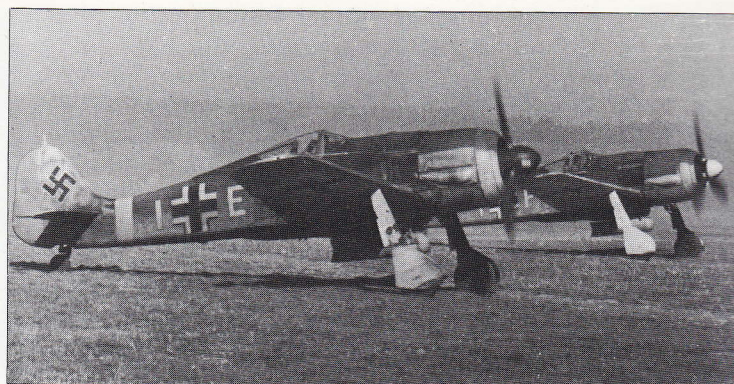
Type: single-seat fighter-bomber

Powerplant: one 1324-kW (1,776-hp)

Junkers Jumo 213A-1 inverted-Vee piston engine

Performance: maximum speed 685 km/h (426 mph) at 6600 m (21,655 ft); climb to 6000 m (19,685 ft) in 7 minutes 6 seconds; service ceiling 12000 m (39,370 ft); range 835 km (519 miles)

Weights: empty 3490 kg (7,694 lb);



maximum take-off 4840 kg (10,670 lb)

Dimensions: span 10.50 m (34 ft 5.4 in); length 10.20 m (33 ft 5.6 in); height 3.35 m (11 ft 0 in); wing area 18.30 m² (196.99 sq ft)

Armament: two 13-mm (0.51-in) MG 131 machine-guns and two 20-mm MG

Two Fw 190F-8s set off on a bombing mission in the USSR in 1944 carrying 250-kg bombs.

151 cannon, plus one 500-kg (1,102-lb) SC500 bomb



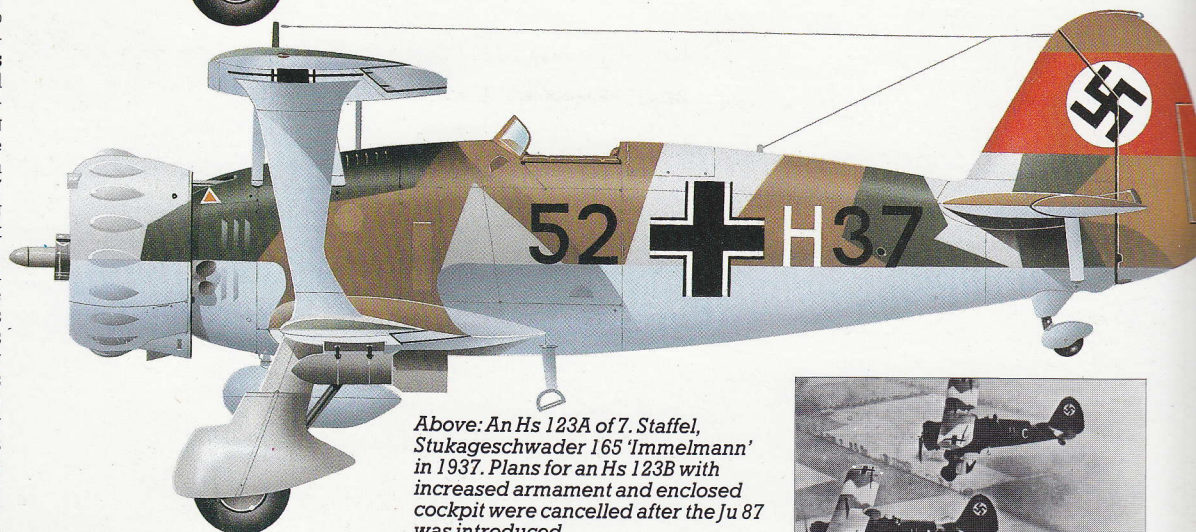
GERMANY

Henschel Hs 123

Designed to an official requirement for a dive-bomber, issued in 1933, the **Henschel Hs 123** single-bay sesquiplane was of all-metal construction, with fabric covering used only for the rear portions of the wings and the control surfaces. Powered by a 485-kW (650-hp) BMW 132A-3 radial engine, the prototype flew in 1938 and quickly established its superiority over the rival Fieseler Fi 98. The third prototype was the first to be armed, carrying two fixed forward-firing 7.92-mm (0.31-in) MG 17 machine-guns in the fuselage top decking. The first three aircraft were flown to Rechlin for testing in August 1935, in the course of which activity two of them were destroyed when their wings came off in dives. A fourth prototype tested successfully the structural changes introduced to overcome this problem and initial production orders were placed for the **Hs 123A-1**, which retained the blistered cowling of the second and third prototypes, rather than the NACA cowling of the first. Power was provided by the BMW 132Dc radial engine and, in addition to the two fixed MG 17 machine-guns, a mounting for a 250-kg (551-lb) bomb or an external fuel tank was included beneath the fuselage, and four 50-kg (110-lb) bombs could be carried on underwing racks. The Hs 123 was built at Henschel's Schönefeld and Johannisthal factories in Berlin, but although the company built two prototypes of an improved **Hs 123B** version with the 716-kW (960-hp) BMW 132K engine, the second having two additional MG 17 machine-guns and an enclosed cockpit, the Luftwaffe expressed its satisfaction with the Junkers Ju 87 and production ended. The Hs 123A first entered service with 1./StG 162 in the autumn of 1936, although its career as a front-line dive-bomber was short-lived because the Junkers Ju 87A Stuka began to replace it in 1937. Five 123As were supplied to the Legion Condor in Spain in December 1936; the type also saw operational service as a close support aircraft in Poland during the closing months of 1939 and in the campaigns in France and Belgium during the spring of 1940. It was withdrawn finally in 1944.



Above: The Henschel Hs 123 dive bomber entered service in 1936, but was soon overshadowed by the Ju 87 Stuka, which joined the Luftwaffe the following year. Tested in Spain, it saw operational service in Poland and in the campaign in the West in 1940.



Above: An Hs 123A of 7. Staffel, Stukageschwader 165 'Immelmann' in 1937. Plans for an Hs 123B with increased armament and enclosed cockpit were cancelled after the Ju 87 was introduced.

Specification

Henschel Hs 123a-1

Type: dive-bomber/close-support aircraft

Powerplant: one 656-kW (880-hp)

BMW 132Dc radial piston engine

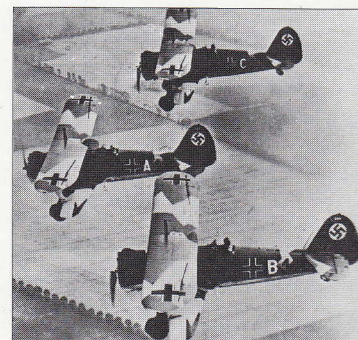
Performance: maximum speed 340 km/h (211 mph) at 1200 m (3,935 ft); cruising speed 315 km/h (196 mph) at 2000 m (6,560 ft); service ceiling 9000 m (29,530 ft); range 855 km (531 miles)

Weights: empty 1500 kg (3,307 lb);

maximum take-off 2215 kg (4,883 lb)

Dimensions: span, upper 10.50 m (34 ft 5.4 in) and lower 8.00 m (26 ft 3 in); length 8.33 m (27 ft 4 in); height 3.20 m (10 ft 6 in); wing area 24.85 m² (267.49 sq ft)

Armament: two fixed forward-firing 7.92-mm (0.31-in) MG 17 machine-guns, plus provision for 450 kg (992 lb) of bombs



Three Henschel Hs 123s pose for the camera in pre-war colours. Production ceased after only one year.

A Shot in the Dark

In 1942 the Soviet air force had sustained such colossal casualties at the hands of the Luftwaffe that daylight attacks had to be all but abandoned. Instead, the Soviets resorted to irritating night raids, at low level and often using obsolescent aircraft. The Germans promptly followed suit, and for the rest of the war ageing aeroplanes took off nightly to harass the Soviet front line.

The resort to widespread night harassment by German aircraft during the great campaign in the East was virtually unique in World War II but, for exactly the same reason of loss of air superiority, came to be adopted almost 10 years later by the Communist air forces over Korea. Yet for all their extemporized nature, the attacks over the Eastern Front in World War II proved to be extremely effort-effective and a number of Axis pilots became highly proficient in these unorthodox tactics.

Indeed the German-sponsored expedient itself developed from Soviet tactics in 1942 when, having never achieved an initiative in the air since the launch of Operation 'Barbarossa', Soviet pilots started flying Polikarpov Po-2 light biplanes (*Nämaschinen*, or 'sewing machines', as they were dubbed by German soldiers) over the advancing German forces. These operations, while scarcely ever achieving the slightest damage by their haphazard nature and with the tiny bombs carried, did nevertheless act as an abrasive on the nerves of the Germans, so that even before the front began to stabilize towards the end of 1942 the Luftwaffe had itself created a number of *Behelf-*

skampfstaffeln (provisional bombing squadrons). These were regularized in November as *Störkampfstaffeln* (literally disturbing bomber squadrons), with units assigned to specific sectors of the front, such as *Behelfsnachtkampfstaffeln* Don and Volga; of these the task of the former was, for instance, to harass the Soviet night workers in the Stalingrad munitions factories. Flying such obsolete aircraft as the Gotha Go 145 and Arado Ar 66 biplanes, many of the pilots were past the normal age accepted for combat or, at the other end of the scale, young pilots awaiting posting to regular combat units. Later, as greater skills were demanded and casualties among the young pilots were deemed wasteful, volunteer pilots among redundant flying instructors were eagerly accepted.

Throughout 1943 the *Behelfskampfverbände* proliferated, and within a year the number of aircraft to which the Bucker Bü 131 Jungmann, Focke-Wulf Fw 58 Weihe, Heinkel He 46 and He 51, Henschel Hs 126 and Siebel Si 204, as well as the Dutch Fokker C.V, Italian Fiat CR.42 and Caproni Ca 314 had been added, had risen to around 300. On 18 October that year the Luftwaffe's entire 'ground-support arm' underwent complete reorganization to adapt it more closely to the demands of defensive warfare

A Henschel Hs 123 roars out of the darkness, dropping four SC-50 50-kg (110-lb) bombs from its wing racks as Soviet troops run for cover. The German Nachtschlachtgruppen specialized in using otherwise obsolete aircraft for low-level night attacks on the Eastern Front.



The Heinkel He 46 was in service only as a trainer in 1939, but in common with many types was pressed into service as a night harasser. This aircraft operated with Nachtschlachtgruppe 7 in the Balkans, under the orders of Fliegerführer Kroatien.

(the Allies having wrested the initiative in the East and in the Mediterranean), and the harassment units were renamed *Nachtschlachtgruppen* (night assault groups): NSGr 1 with Go 145s and He 46s on the Eastern Front until mid-1944 when it moved to France with redundant Junkers Ju 87Bs; NSGr 2 with Bü 131s and Go 145s on the northern sector of the Eastern Front until mid-1944 when it moved, first to northern Italy and then to the West with Ju 87Ds; NSGr 3 with Ar 66s and Go 145s on the central sector of the Eastern Front; NSGr 4 with Go 145s, and later Ju 87Bs, on the central and southern sectors of the Eastern Front; NSGr 5 with Go 145s on the southern sector of the Eastern Front, and later in Romania and Hungary; NSGr 6 with Go 145s in Italy; and NSGr 7 with Hs 126s in Croatia.



Kenneth Lock

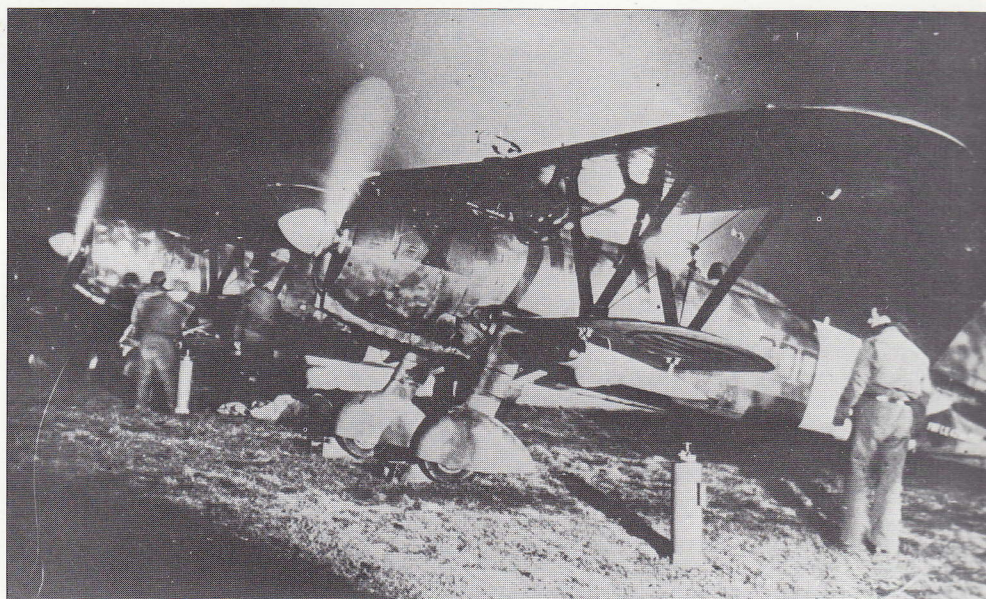
Soon afterwards NSGr 11 was formed with Bü 131s, He 66s and Hs 126s flown largely by Estonian pilots, as well as NSGr 12 with Bü 131s and Hs 126s flown by Latvian pilots.

The operations by these units were carried out with the utmost bravery, not to mention the difficulties involved. In many instances the pilots flew their old aircraft from dirt roads, often (through lack of radio and dependence on map reading as their only means of navigation) being unable to find their 'base' and, having landed, to contact their scattered support personnel. Bearing in mind that almost all their missions were flown in darkness, the successes achieved by the 'night assaulters' provide ample testimony of their devotion to duty.

Veteran hero

One of the 'old hands' was the veteran NCO, Oberfeldwebel Ludwig Bellof who became a pilot in 1941, joined NSGr 3 as one of its original pilots in December 1942 and flew the Ar 66 in night operations against resisting forces on the Leningrad front, and later around Vitebsk and Polotsk in northern Belorussia. On one occasion, after a night attack on a village 97 km (60 miles) north of Minsk, Bellof returned with literally hundreds of bullet holes in his old biplane. He survived the war, having flown about 800 combat missions with the harassment units and being awarded one of only seven Knight's Crosses given to the night assaulters.

Not all the operations were of a strictly offensive nature, as witness the use of NSGr 5 with their Fieseler Storch short-field aircraft in support of the German pocket of resistance at Budapest in February 1945, a necessary expedient following the loss of all airfields in the



area. Two names stand out in these operations: Oberfeldwebel Josef Flögel and Hauptmann Franz-Karl Theyerl. Flögel was a veteran of operations in Ar 66s and Go 145s on the southern sector; he flew numerous 'courier' flights to the beleaguered forces in the Hungarian capital and won the Knight's Cross before being taken prisoner by the Soviets when the city fell. Theyerl was a young Austrian, and flew more than 500 harassment missions in Ar 66s, Fw 58s, Go 145s and He 46s; Theyerl was captured by the Soviets in Budapest but managed to escape from the train in which he was being taken to the East and reached his home in Bavaria shortly after the war; he not only held the Knight's Cross but also the German Cross in Gold.

Until 1944 the *Nachtschlachtgruppen* were able to deliver only very small weapons against the enemy, these being confined to an occasional 50-kg (110-lb) bomb, or perhaps three or four 20-kg (44-lb) bombs. The favourite weapon was, however, the 2-kg (4.4-lb) SD 2 fragmentation bomb, most of the old biplanes being racked to carry up to 20 such weapons for attacks against Soviet truck parks and

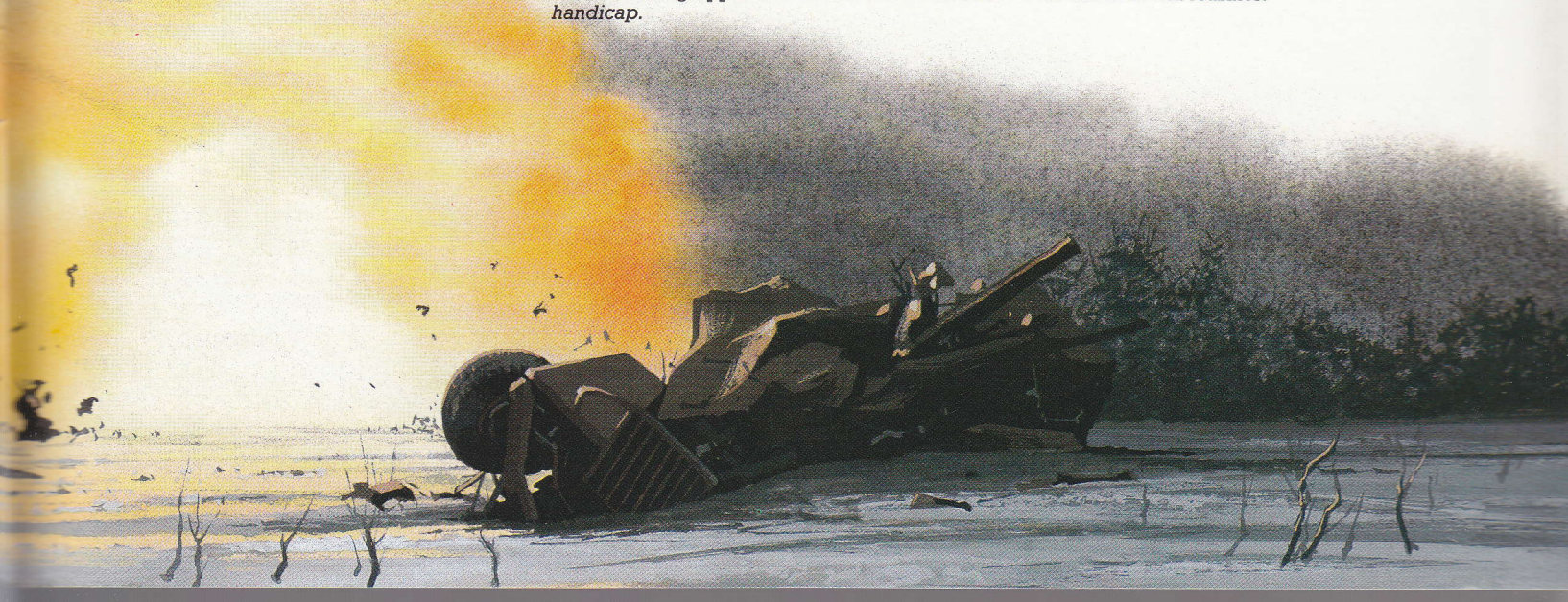
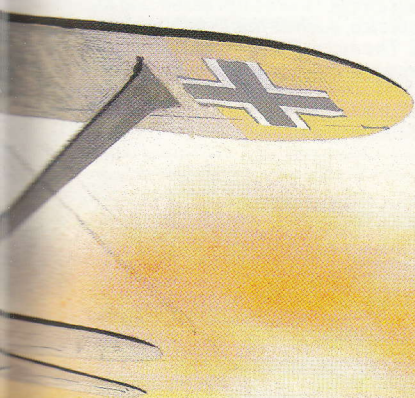
The Fiat CR.42 was soon outmoded in the desert war, but like the Germans the Italians saw a use for them in night harassment. These examples are about to launch a night attack on a British column in Cyrenaica.

tented encampments. Many pilots also carried panniers of hand grenades in their cockpit which they would toss out as they flew low over enemy troop concentrations. There were also recorded instances of fairly large fuel and ammunition dumps being destroyed simply by the use of Molotov cocktails thrown from the cockpits! Attacks were almost invariably carried out by relays of single aircraft throughout a single night, seldom returning to the same target on successive nights so as to avoid unnecessary losses from strengthened and alerted flak defences.

A new chapter in the affairs of the night assaulters began in 1944 when most of the Ju 87D-equipped *Schlachtfliegergeschwader* (SG) began converting to the ground attack versions of the Focke-Wulf Fw 190. Apart from the dedicated anti-tank Ju 87G, which had to remain in service as being highly effective

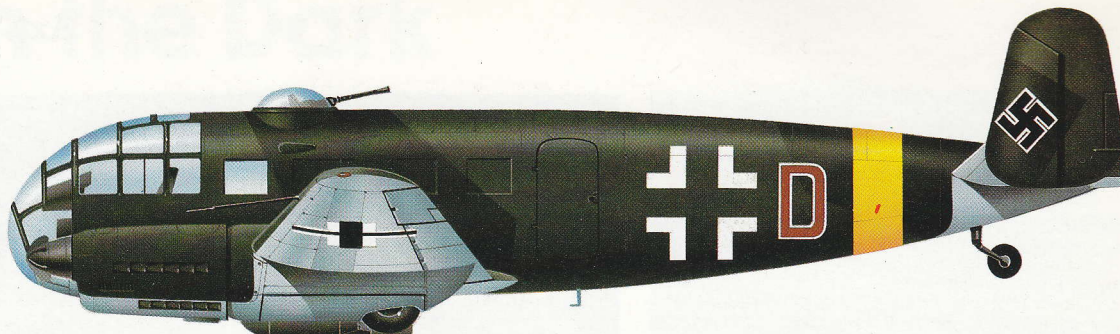
Night-time nuisance raids were seen as highly cost-effective operations, hampering enemy troop movements and denying rest to units in the line. Operating under the cloak of darkness, the relative lack of performance of Nachtschlachtgruppen machines was not a serious handicap.

Successful raids were short, brutal affairs: loitering over alerted Soviet defences in slow, fragile aircraft was not a recipe for victory. Over the less well protected rear areas, more leisurely harassment was feasible.



A Shot in the Dark

A Siebel Si 204E of 2./Nachtschlachtgruppe 4, based at Malacky, Slovakia, in November 1944. Such aircraft would have been used in what would now be called 'psy-war' including such tasks as leaflet-dropping as well as in the more usual role of Staffel or Gruppe communications aircraft.



against the mass of Soviet armour despite enormous losses among the 'old hands', almost all the redundant Ju 87s (Bs and Ds) were distributed among the *Nachtschlachtgruppen*, particularly NSGr 9 which achieved a measure of success against the British and American forces in Italy. NSGr 1 and 2 eventually flew Ju 87s in the West, but the most outstanding of all was NSGr 20 which was formed out of III/KG 51. It was at that time that a new name rose to prominence among the night assaulters. Kurt Dahlmann had been an experienced bomber pilot almost since the beginning of the war before commanding the fast bomber *Gruppe*, SKG 10. Under his command this fighter-bomber unit flew the Fw 190G-1 in night/bad-weather attacks against southern England, being renamed III/KG 51 and then NSGr 20 in November 1944 when based at Twenthe in the Netherlands. Led by Dahlmann (who had received the Knight's Cross earlier in 1944), small sections of Fw 190s, each carrying a 1800-kg (3,968-lb) bomb, carried out sneak night raids, often in appalling weather, against key targets behind the Allied lines, including headquarters buildings, tank parks, road and rail junctions, bridges and lock gates. The attacks were skilfully planned and executed, and considerable damage was done in dozens of instances, the Allied authorities not always aware that an air attack had been responsible simply because only a single bomb might have been dropped. On at least one occasion the destruction of a fuel dump in Belgium was ascribed to the work of saboteurs, but it is now clear that it was caused by one of Dahlmann's pilots. That,



Gotha aircraft did not match their combat exploits of World War I, but the two-seat Go 145 basic trainer was extensively used on the Eastern Front for night nuisance raiding, continuing in this role until the end of the war.



The Bücker Bü 131 was, along with the Gotha Go 145, one of the mainstays of Nachtschlachtgruppe 2 on the northern sector of the Eastern Front, operating against Leningrad, amongst other locations. The Gruppe was eventually transferred to the west and equipped with redundant Ju 87s.

surely, was the very essence of night harassment. Major Dahlmann himself survived to receive the Oakleaves on 24 January 1945.

One other *Gruppe* remains to be mentioned. Following attempts by NSGr 20 to destroy the vital bridge over the Rhine at Remagen in March 1945, some Junkers Ju 88P-3s were assembled from NSGr 4 and 9 (with pilots from IV/NJG 2 and KG 3) and formed into NSGr 30 for operations against the American and British forces in the West. Flying at low level by night in pairs (one of the aircraft illuminating the target with flares) the Ju 88 crews carried out a score of attacks in the closing weeks of the war, particularly against crossing points on the

Rhine and on Allied airfields in the Low Countries but, after suffering heavy casualties, were eventually grounded through fuel shortage. Alas, on account of the hastily improvised nature of so many of *Nachtschlachtverbände's* operations, the vast proportion of their work went unrecorded and remains only in the memory of a dwindling number of survivors.

Many captured aircraft were impressed into night harassment service, such as this Dutch-built Fokker C.V-E. The aircraft was taken from the Danish air force and used on the Eastern Front in 1943, from where it was flown to neutral Sweden in October 1944 by four Estonians and eventually returned to Denmark in 1947.





GERMANY

Henschel Hs 129

Henschel was one of four companies (the others being Focke-Wulf, Gotha and Hamburger Flugzeugbau) to which, in April 1937, the Reichsluftfahrtministerium issued a specification for a twin-engine ground-attack aircraft. It was required to carry at least two 20-mm MG FF cannon and to have extensive armour plating protection for crew and engines. The two designs for which development contracts were awarded on 1 October 1937 were the Focke-Wulf Fw 189C and **Henschel Hs 129**. The latter was a Friedrich Nicolaus design with a light alloy stressed-skin fuselage of triangular section. It contained a small cockpit with a restricted view, necessitating the removal of some instruments to the inboard sides of the engine cowlings. The windscreen was made of 75-mm (2.95-in) armoured glass and the nose section was manufactured from armour plating. Nose armament comprised two 20-mm MG FF cannon and two 7.92-mm (0.31-in) MG 17 machine-guns. Although the Henschel aircraft was considered to be underpowered and to have too small a cockpit, the company was awarded a contract for eight pre-production aircraft, two of which were converted at Schönefeld to accept Gnome-Rhône 14M 4/5 radial engines. It was with this powerplant that 10 **Hs 129B-0** development aircraft were delivered from December 1941; armament comprised two 20-mm MG 151/20 cannon and two 7.92-mm (0.31-in) MG 17 machine-guns. The production **Hs 129B-1** series became operational on the Eastern Front, where the type was to be used most widely, although it served also in North Africa, Italy, and in France after the D-Day landings.

By the end of 1942 the growing capability of Soviet tank battalions made it essential to develop a version of the Hs

129 with greater fire-power, leading to the **Hs 129B-2** series which was introduced into service in the early part of 1943. They included the **Hs 129B-2/R1** which carried two 20-mm MG 151/20 cannon and two 13-mm (0.51-in) machine-guns; and the **Hs 129B-2/R3** with the two MG 13s deleted but equipped with a 37-mm BK 3.7 gun. Final production variant was the **Hs 129B-3** of which approximately 25 were built and which carried an electro-pneumatically operated 75-mm BK gun.

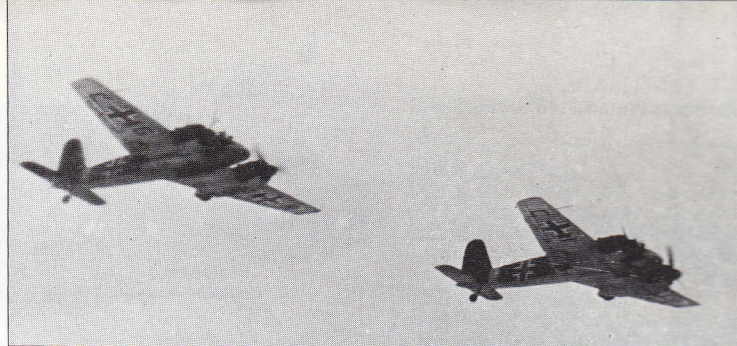
Specification

Henschel Hs 129B-1/R2

Type: single-seat ground-attack aircraft

Powerplant: two 522-kW (700-hp) Gnome-Rhône 14M radial piston engines

Performance: maximum speed 407 km/h (253 mph) at 3830 m



The Henschel Hs 129 was designed to a 1937 specification for an armoured, twin-engined ground attack aircraft. Far superior to Allied equivalents, it showed how much importance the Germans attached to close air support.

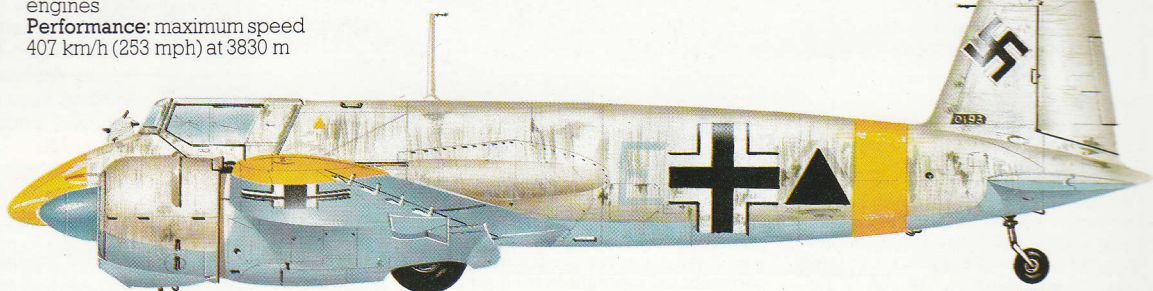
(12,565 ft); service ceiling 9000 m (29,525 ft); range 560 km (348 miles)

Weights: empty 3810 kg (8,400 lb); maximum take-off 5110 kg (11,266 lb)

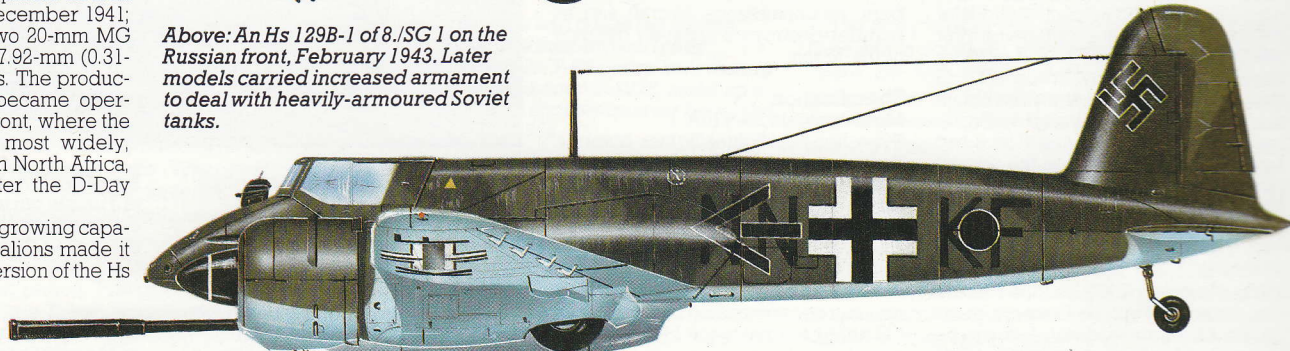
Dimensions: span 14.20 m (46 ft 7.1 in); length 9.75 m (31 ft 11.9 in); height

3.25 m (10 ft 8 in); wing area 29.00 m² (312.16 sq ft)

Armament: two 20-mm MG 151/20 cannon, two 7.92-mm (0.31-in) MG 17 machine-guns and one 30-mm Mk 101 cannon



Above: An Hs 129B-1 of 8./SG 1 on the Russian front, February 1943. Later models carried increased armament to deal with heavily-armoured Soviet tanks.



Twenty-five Henschel Hs 129s mounted a 75-mm (2.95-in) gun capable of destroying even the most well-protected enemy AFVs.

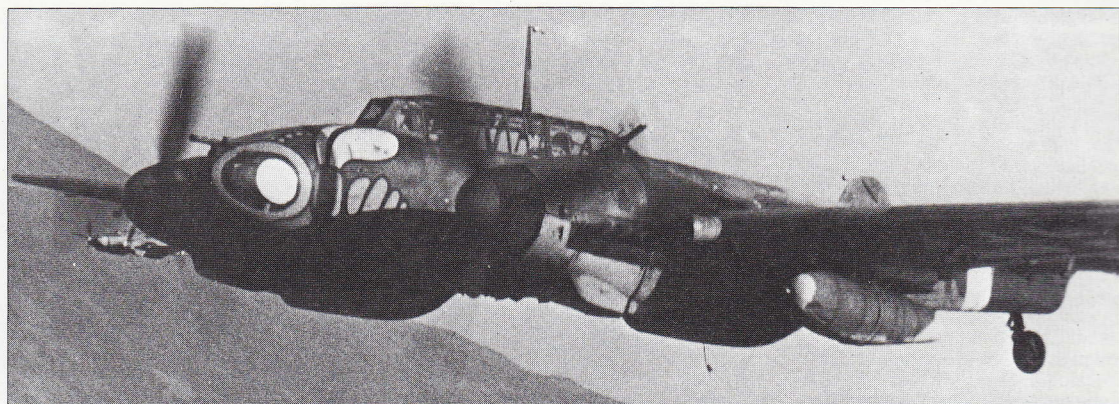


GERMANY

Messerschmitt Bf 110

Like so many German aircraft which underwent adaptation for service in operational roles other than those for which they were originally intended, the **Messerschmitt Bf 110 Zerstörer** (destroyer, or heavy fighter) had proved unsuitable in the role of day bomber escort when confronted by modern interceptor single-seat fighters, but came to be widely used in the ground attack/fighter-bomber role. During the Battle of Britain Bf 110Cs and Ds of V(Z)/LG 1, II/ZG 26 'Horst Wesel', I/ZG 76, and 1. and 2./ErpGr 210 carried out numerous fighter-bomber attacks, the latter *Staffeln* being components of a *Gruppe* specifically created to introduce fighter-bombing/pathfinding tactics to the Luftwaffe under Hauptmann Walter Rubensdörffer (who was killed following a raid on Croydon on 15 August 1940).

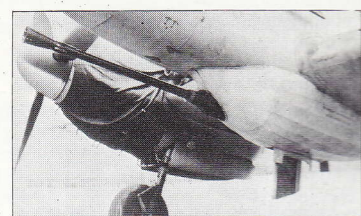
The first dedicated fighter-bomber version of the Bf 110, after the Bf 110C-4B and D-2 sub-series adaptations, was the **Bf 110E** series, and this version equipped the two ground-attack units deployed in the East when Operation 'Barbarossa' was launched against the



USSR on 22 June 1941. These were Zerstörergeschwader 26 'Horst Wessel' and Schnellkampfgeschwader (fast bomber wing) 210, the latter having been created out of ErpGr 210, expanded to *Geschwader* proportions and equipped with Bf 110E-1 aircraft following the failure of the Me 210 to meet operational demands. These were soon joined by Bf 110E-equipped

Above: the Messerschmitt Bf 110G-2 was widely used in the ground attack role. This is an aircraft of II/ZG 1 over Italy in 1943.

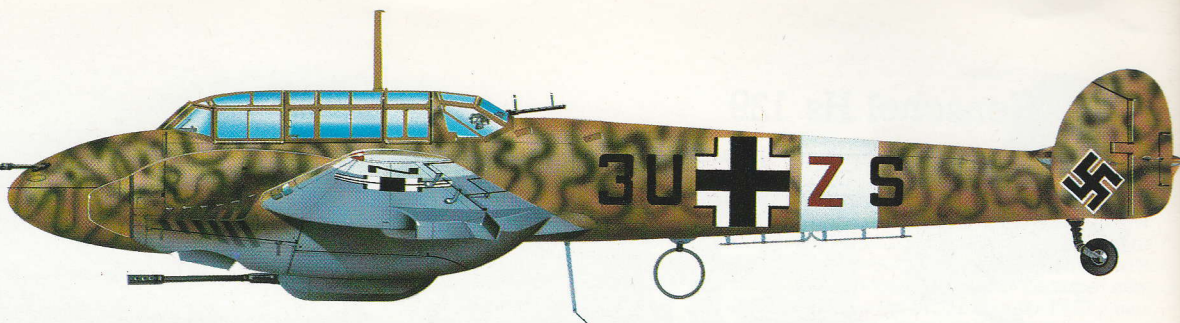
Right: A close-up of the BK 37-mm (1.45-in) anti-tank gun fitted to some Bf 110G-2s. No heavier weapons were introduced, as the Bf 110s were diverted to the night-fighter role.



Messerschmitt Bf 110 (continued)

Staffeln of 11/ZG 1, and were heavily committed during the early fast-advancing offensives, attacking Soviet aircraft on their airfields as well as soft-skinned transport vehicles with deluges of fragmentation bombs.

The E-series was joined early in 1942 by sub-variants of the DB 605B-powered Bf 110G-series. The Bf 110G-2 was widely used in the ground attack/anti-tank role, the R1, R2 and R3 *Rustsatz* field kit introducing 37-mm Flak 18 and 30-mm MK 108 cannon to the Bf 110's armament. Towards the end of 1942, however, these guns began to fail to penetrate Soviet tank armour, particularly in the case of the arrival of the T-34 tank, and much less reliance came to be placed on the *Zerstörergruppen* in the ground attack function. In any case almost all Bf 110 production was by then being distributed among night-fighter units for the defence of Germany against the grow-



A Messerschmitt Bf 110E of 8./ZG 26 based at Berca, North Africa, in September 1942. It is armed with the powerful MK 101 30-mm cannon, for use in the tank-busting role.

ing offensive by RAF Bomber Command. Only in the closing weeks of the war, when the Allies were jamming the night-fighters into helplessness, were the surviving Bf 110s ordered to pursue night ground-attacks against the advancing Allied armies, but by then the RAF's de Havilland Mosquitoes ruled the night skies over Germany.

Specification

Messerschmitt Bf 110C-4/B

Type: two-seat ground attack fighter-bomber

Powerplant: two 895-kW (1,200-hp) Daimler-Benz DB 601N inverted V-12 piston engines

Performance: maximum speed 473 km/h (294 mph) at sea level; climb to 1650 m (5,415 ft) in 3.8 minutes; service ceiling 8300 m (27,230 ft); normal range about 790 m (490 miles)

Weights: empty 5200 kg (11,464 lb); maximum take-off 6910 kg (15,234 lb)

Dimensions: span 16.28 m (53 ft 4.75 in); length 12.10 m (39 ft 8.5 in); height 3.51 m (11 ft 6 in); wing area 38.37 m² (413.0 sq ft)

Armament: two 20-mm MG FF cannon and four 7.92-mm (0.31-in) MG 17 machine-guns in the nose and twin 7.92-mm MG 81 guns in the rear cockpit, plus racks for two 250-kg (551-lb) bombs under the wing roots

GERMANY



Messerschmitt Me 210 and Me 410

The Germans pinned high hopes on the **Messerschmitt Me 210**, which first flew on 2 September 1939, as an ultimate replacement for the Bf 110. However, after the prototype (with twin fins and rudders, like the Bf 110) displayed chronic instability and later crashed during flutter trials (even after resort to a large single fin and rudder), development was slow. It was not until the end of 1940 that a few preproduction aircraft were delivered to Erprobungsgruppe 210, the unit that had been formed to introduce the aircraft into operational service before the Battle of Britain. The principal ground attack variants were the **Me 210A-2** with DB 601A engines and the **Me 410C-2** with DB 605B engines; these started to equip 11/ZG 1 on the Eastern Front shortly after the German attack on the USSR opened but, following a number of fatal accidents when pilots lost control in shock stalls during ground attacks, the aircraft was quickly withdrawn from operational use. By the time a remedy had been found, in mid-1942 (by fitting wing slats), some 600 aircraft had been completed and the majority of these underwent modification.

In the event no more than 258 Me 210s ever reached the Luftwaffe and few of the modified aircraft equipped fully-operational ground-attack units. This was because, by 1943, interest centred on the **Me 410 Hornisse** (hornet), which was in effect a DB 603A-powered Me 210 with lengthened engine nacelles and all the stability-associated modifications found essential in the earlier aircraft. By 1943 the operational distinction between close-support and tactical bombing had become blurred in the Luftwaffe and, although the **Me 410A** equipped 5./KG 2 at Lechfeld, and 2.(F)/122 and 111/ZG 1 in the central Mediterranean, only the operational sorties by the last-named unit could be described as 'close support' of the German army. Another bomber unit, 1./KG 51 'Edelweiss', was equipped with Me 410As in June 1943 for night raids over the UK (and, on account of its excellent performance, proved a tough adversary even for the RAF's de Havilland Mosquito night-fighters); however, 1./KG 51 switched to the tactical role at the time of the Nor-

mandy landings and became very active over the invasion area. Of the total of 1,160 Me 410s produced, not more than about 200 ever equipped ground-attack units, the remainder serving as conventional medium-level light bombers, reconnaissance aircraft and as bomber-destroyers in the air defence of the Reich.

Specification

Messerschmitt Me 410A-1

Type: two-seat fighter/fighter-bomber

Powerplant: two 1305-kW (1,750-hp) Daimler-Benz DB 603A inverted V-12 piston engines

Performance: maximum speed 638 km/h (396 mph) at 6700 m (21,980 ft) or 549 km/h (341 mph) at sea level; climb to 6700 m (21,980 ft) in 10.7 minutes; service ceiling 10000 m (32,810 ft); normal range 1480 km (920 miles)

Weights: empty 6050 kg (13,338 lb); maximum take-off 10530 kg (23,215 lb) **Dimensions:** span 16.35 m (53 ft 7.75 in); length 12.41 m (40 ft 8.5 in);

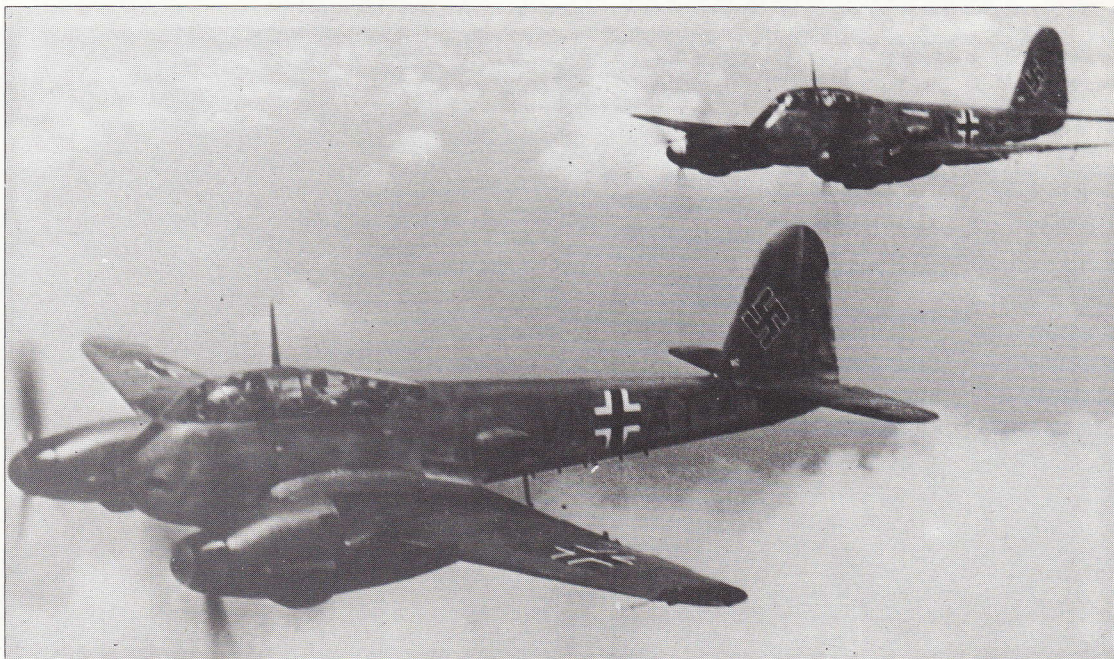


height 4.28 m (14 ft 0.5 in); wing area 36.19 m² (389.6 sq ft)

Armament: two MG 151/20 20-mm cannon and two 7.92-mm (0.31-in) MG 17 machine-guns in the nose and single 13-mm (0.51-in) MG 131 heavy machine-gun in each of two remotely-controlled FDL 131 barbettes on the sides of the centre fuselage, plus a bombload of up to two 1000-kg (2,205-lb) bombs internally, or up to 10 50-kg (110-lb) bombs internally and on external racks

This Me 210A-1 of 111/ZG 1 was based in Tunisia during the final stages of the battle for North Africa, during April 1943. The aircraft were used in the Zerstörer/ground attack role.

Seen during the aircraft's trials, one of the eight pre-production Me 210A-0s is seen in formation with an Me 210A-1, the nearer of the two. Seen in retrospect the craft was unsuccessful from the first.



Syria



Of all the Middle East Arab nations, none is more hostile to Israel than Syria. Syria shares a substantial border with Israel at the moment, but even in the past when the two nations were separated geographically to a greater extent, it was usually Syria that was viewed by Israel as its most dangerous enemy, and during the period when Egypt was Israel's most implacable short-term foe Syria was felt to be its greatest long-term enemy. Fortunately for Israel, Syria has for long been a nation where internal security has been a greater worry for its rulers than any external threat, and the present regime is now as much beset by political and religious unrest within its borders as it is by external military threat. In purely military terms Israel now holds the dominating Golan heights that command the routes to the Syrian capital, Damascus, and even partially outflanks the previous established borders in southern Lebanon.

The Syrian armed forces are still among the most powerful in the Middle East. To a very great extent Syria is also one of the Soviet Union's most receptive allies in the Middle East, and while the present regime may be regarded as more authoritarian than Marxist, the Soviet Union continues to wield considerable influence on Syrian policies. As a result the Syrian armed forces are equipped with all manner of Soviet weaponry and are to a great extent organized and conducted along conventional Soviet lines. Much of the equipment provided to the Syrians is paid for by oil exports, but a large proportion of it has been supplied on a nominal cost basis. Whenever the Syrian armoury has been severely depleted, as it was in the 1973 war with Israel, new equipment has been supplied within days, and even during the recent campaign in Lebanon losses were made good within a very short period. Typical of this was the situation when all the Syrian anti-aircraft missiles in the Bekaa Valley were destroyed by the Israeli air force: these were replaced by new missiles flown in directly from the Soviet Union to Syrian airfields.

The Syrians have always been a warlike race, and the current regime relies on the armed forces not only as an instrument of external policy (as in Lebanon) but also as an internal political prop. In return for this support the armed forces are liberally supplied not only with equipment but with extras such as appropriated buildings, vehicles and even control of some industries. The use of a widely imposed conscription policy further increases the importance of



Since the 1960s Syria has had one of the largest tank forces in the Middle East and currently operates over 4,000 MBTs. T-62s, seen here during Syrian intervention in Lebanon in 1976, make up a quarter of the total, with another quarter being the new T-72 and the rest T-55s.

the Syrian armed forces. The current period of service is 2½ years, but even before that the armed forces play a considerable part in the military training that reaches down to secondary education level. The armed forces also figure prominently in the running and operation of the various internal intelligence agencies that maintain a political vigil over most types of activities within the state.

The Syrian Army

The Syrian army has a nominal strength of 170,000, of whom only 50,000 are regulars. To these can be added a number of other organizations, including the strong Worker's Militia, various gendarmeries and other border guard units, and even two Palestinian Liberation Army brigades led by Syrian officers and equipped with tanks and artillery. Part of the Air Defence Command also comes under army control.

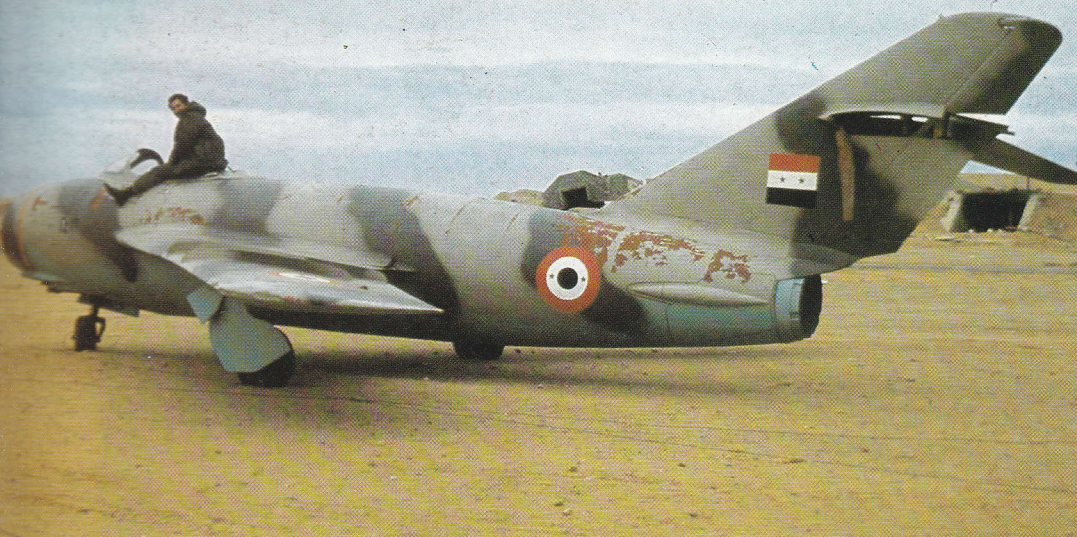
The army is organized along conventional Soviet lines and is equipped largely with Soviet weapons. There are four armoured divisions, one of them assigned as an elite Presidential Guard unit, and each armoured division has two armoured brigades and one mechanized brigade. There are two mechanized divisions, each with two mechanized brigades and one armoured brigade. To this main combat force can be added two independent armoured brigades, four independent mechanized brigades, and two artillery brigades. There are five commando regiments, some of them based in Lebanon, and a single paratroop regiment. There are also two surface-to-surface missile regiments, one with FROG and the other with 'Scud' missiles. Air defence is the province of about 26 SAM batteries equipped with SA-2, SA-3 and SA-6 missiles.

As noted above, nearly all the equipment used by the Syrian army is supplied direct from the Soviet Union, and current tank stocks stand at well over 4,000. Most of these are T-54s and T-55s, complemented by about 1,000 T-62s and 1,000 T-72s. Despite this numerical strength the Syrians have not shown up well in past conflicts with the Israeli armoured forces, and during the 1973 conflict the Syrian army lost what was virtually its entire tank fleet. Control and communication between units still remains an inherent problem for the Syrian commanders, who appear to rely on strict obedience to orders and rigid planning rather than tactical flexibility. Maintenance appears to be an ever-present problem, even when considering the large fleet of reconnaissance vehicles (BRDM) and armoured personnel carriers (BMP, BTR-40, BTR-50, BTR-60, BTR-152 and OT-64).

The Syrian army is also strong in artillery, which includes nearly all the latest Soviet developments including the self-propelled 122-mm (4.8-in) 2S1. Rocket-launchers of calibres up to 240 mm (9.45 in)



Syrian troops patrol West Beirut in BTR-152s, the USSR's first post-war APC, which was first seen parading through the streets of Moscow in 1951. While Syria possesses over 400 sophisticated BMP MICVs, these older vehicles are more appropriate for low-intensity urban operations.



Although MiG-21s constitute the main strength of the Syrian Arab air force, some 85 MiG-17s are still in front-line service, equipping four of the fighter/ground-attack squadrons. The MiG-17 pictured here was sabotaged by the Syrians shortly before the air base was overrun by advancing Israeli forces, to prevent its re-use against its former owners.

naval bases are at Tartus, Minet-el-Baida and Latakia, but these are usable only by small naval craft, which is all the Syrian navy operates. Apart from the two ex-Soviet frigates and the four small corvettes being delivered from the Soviet Union, nearly all the vessels are used for coastal duties only. The main striking force consists of 18 fast attack vessels armed with missiles and a further eight torpedo-armed attack craft. Three minesweepers, three coastal patrol craft and a single large patrol boat make up the rest of the Syrian navy's numbers.

are widely used, as are heavy mortars with calibres up to 240 mm (9.45 in). The artillery includes large numbers of anti-tank guns (which can double as field guns) along with 'Sagger', 'Spigot' and 'Swatter' anti-tank missiles; to the latter the Milan missile has been added from French sources. This supply of equipment from France is a recent development and Aérospatiale Gazelle helicopters are also in the pipeline.

Anti-aircraft guns are still widely used for air defence along with the more usual Soviet self-propelled ZSU-23-4 and ZSU-57-2 weapons and the normal array of SAMs.

The Syrian Air Force

On paper the Syrian air force is again strong, numbering some 50,000 men and nearly 500 aircraft of all types. It has some of the most advanced combat aircraft the Soviet Union can supply, but in nearly every encounter it has had with the Israeli air force the Syrian air force has come off very much the worse, typical being one dogfight over Beirut a few years ago where the Syrians lost 20 aircraft and the Israelis none. The main problem again seems to be command and control as individual initiative is not encouraged by the current regime, and maintenance of some of the more sophisticated Soviet-supplied equipment probably leaves something to be desired.

With the Israeli air force within easy striking distance of Damascus and many of the Syrian bases, no less than 12 squadrons are assigned to defence. One of these squadrons has the Mikoyan-Gurevich MiG-25 'Foxbat-A' and the others use either the MiG-21 'Fishbed' or the MiG-23 'Flogger'. There are also 11 fighter/ground attack squadrons, some of which are probably below their established

strengths. Four of these squadrons continue to use the rather elderly MiG-17 'Fresco', three use either the Sukhoi Su-7 or Su-20 'Fitter', and four use the MiG-23BM 'Flogger'. The interceptor squadron equipped with the MiG-25 'Foxbat-A' is also used for reconnaissance over Israeli territory.

There are two transport squadrons equipped with a mix of Antonov An-24 'Coke', An-26 'Curl', Ilyushin Il-14 'Crate', Il-18 'Coot' and a small number of Il-76 'Candid' aircraft. Two Dassault-Breguet Mystère 20s are retained for presidential use.

Helicopters have recently been ordered from France and include Gazelles and Aérospatiale Super Frelons. When all of these have been delivered they will join the usual array of Soviet helicopters that include the Mil Mi-2 'Hoplite', Mi-8 'Hip', Mi-24 'Hind' and a small force of four Kamov Ka-25 'Hormones' used for limited offshore anti-submarine warfare.

The air force also shares the manning of the Air Defence Command, although this is under overall army command. In all this covers no fewer than 87 SAM batteries of which at least four were (for a time at least) known to be fully manned by Soviet technicians. These were the now infamous SA-5 sites in the Bekaa Valley, the only such sites known outside the Soviet Union. Some of these SA-5 batteries are now under Syrian control. Most of the batteries use either the SA-2 or SA-3 SAM, but numbers of SA-6 SAMs are also in service.

The Syrian Navy

The Syrian navy is small and has only 2,500 men with a similar number of reserves. The main Syrian

Order of battle Syrian Army

4 armoured divisions, each with two armoured brigades and one mechanized brigade
2 mechanized divisions, each with two mechanized brigades and one armoured brigade
2 independent armoured brigades
4 independent mechanized brigades
2 artillery brigades
5 commando regiments
1 paratroop regiment
2 SSM missile regiments
26 SAM air defence batteries
2 PLO brigades
Gendarmerie
Desert Guard
Worker's Militia

Syrian Air Force

12 interceptor squadrons: one with MiG-25 'Foxbat-A', and 11 with MiG-21 'Fishbed' and MiG-23 'Flogger-E'
11 fighter/ground attack squadrons: four with MiG-17 'Farmer', three with Su-7 or Su-20 'Fitter', and four with MiG-23BM 'Flogger-F'
2 transport squadrons (An-24 'Coke', An-26 'Curl', Il-14 'Crate', Il-18 'Coot' and Il-76 'Candid')
helicopter units (Mi-2 'Hoplite', Mi-8 'Hip', Mi-24 'Hind', Ka-25 'Hormone', Gazelle, Super Frelon)
Air Defence Command: 87 SAM batteries

Syrian Navy

2 frigates
4 corvettes
18 missile-armed fast attack craft
8 torpedo-armed fast attack craft
3 minesweepers
3 coastal patrol craft
1 large patrol boat

Carrying both Syrian and Israeli markings, this SA 341 Gazelle was brought down during the fighting in Lebanon and is now flown by the Israelis. Syria purchased 45 Gazelles, all but 10 equipped like this example to fire ATGWs, and in June 1984 ordered another 12 from France.



Attacked by the much better trained and equipped Israelis in Lebanon in 1982, the Syrian armoured forces were predictably defeated, leaving large quantities of equipment such as these T-62s in the hands of their enemy.